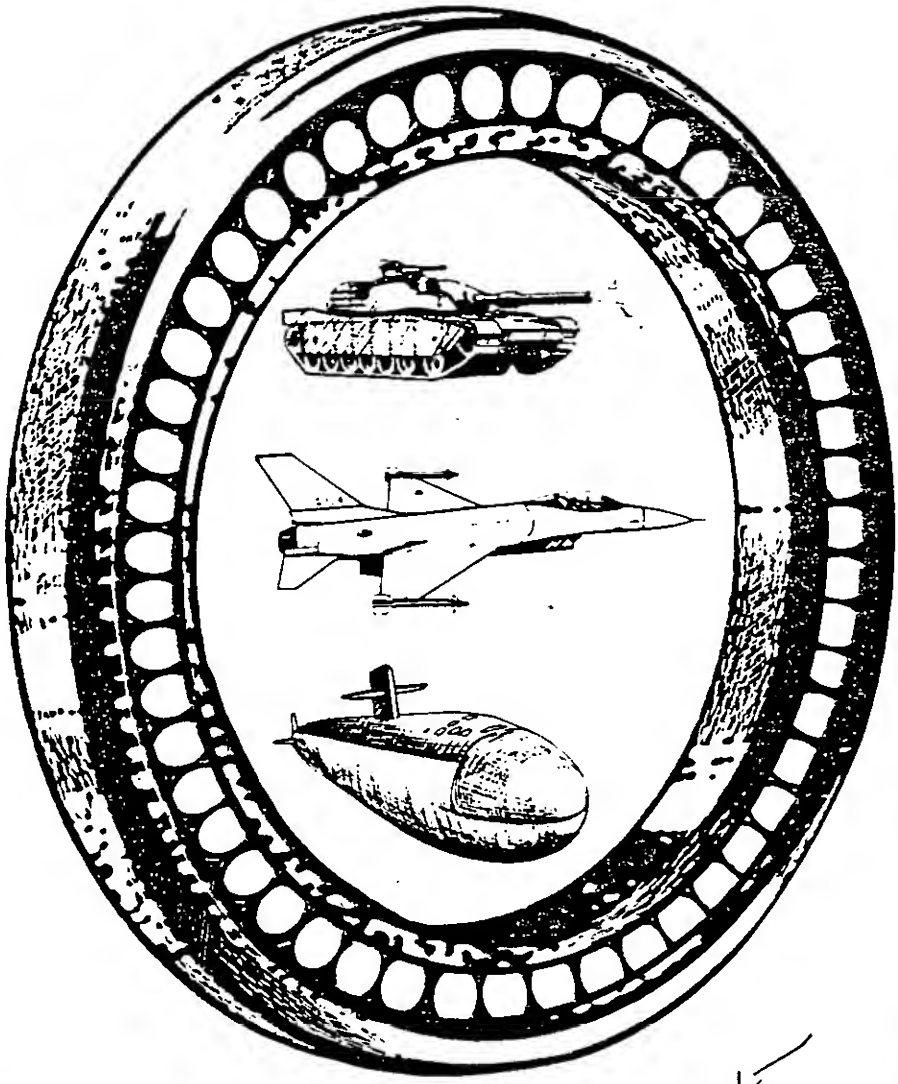
JOINT LOGISTICS COMMANDERS BEARING STUDY

18 JUNE 1986



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PREPARED BY

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OF

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JLC

BEARING INDUSTRY STUDY

CONTENTS

EXECUTIVE SUMMARY

The Deputy Secretary of Defense, William Howard Taft IV, in response to Congressional concern over government policies for procurement of ball bearings and how they affect the domestic industry, requested the Joint Logistic Commanders (JLC) conduct a study of the criticality of the bearing industry to the defense posture. Particular emphasis was to be placed on 30mm and larger bearings. As part of this review a determination was to be made of DOD and commercial bearing requirements, industry capacities, impact of bearing imports on national security in surge and mobilization environments and other factors affecting the bearing industry.

In response to Secretary Taft's request, the JLC tasked the Joint Group for the Industrial Base (JGIB) to establish a study team to address these issues. The team, the Joint Bearing Working Group (JBWG), included personnel from each of the services and the Defense Logistics Agency. The Department of Commerce and the International Trade Commission were asked to become members because of their expertise in trade and economic issues.

The JBWG developed questionnaires designed to gather data for analysis that would answer several taskings. Separate surveys were designed for the bearing industry, engine manufacturers, bearing component suppliers, specialty steel producers and tool manufacturers, all impacting or being impacted by conditions relating to the health of the bearing industry. Major companies in these industries were surveyed and plant visits were conducted at selected facilities to emphasize the criticality of the study and to discuss trade and economic related issues.

After analysis of data collected, discussions with company officials, and review of previous related government studies, the JBWG concluded that the US bearing industry, having been subjected to foreign penetration of the domestic market for an extended period of time, and having suffered the natural consequences of this lost market share, is in imminent danger of being unable to support national defense needs.

Findings

The JBWG concluded that imports of bearings over 30mm in diameter began to impact the position of domestic bearing companies in 1978. Since then, steady erosion of the commercial bearing sector has taken place.

If this trend is permitted to continue, qualified domestic producers will be forced to shut down production lines and some close their doors permanently. Once this production capability is lost it is difficult to regain within a reasonable time. Company officials estimate it would take at least four years to rebuild capability to produce superprecision bearings. Long leadtimes are caused by the design, order and in-place qualification of machine tools, redesign of plant layout, steel supply, and manpower training.

Production capacity within the industry is currently capable of meeting peacetime defense needs. There is however, little capability to expand capacity. While equipment remains idle that previously was used to produce commercial/commodity grade bearings, it is not, in most cases, readily convertible to the production of high precision bearings necessary for DOD weapon systems production. Additionally, peacetime demands upon domestic bearing producers have driven leadtimes beyond 40 weeks for several bearings, forcing OEMs to look elsewhere for sources which can meet their production schedules.

Superprecision bearing production require special equipment and highly skilled labor. This makes interchangeability among bearing lines or companies unlikely. The work force in the bearing industry is ageing; and, because of reduced overall production, fewer opportunities are available to train new and younger employees. These conditions will continue to restrict surge and mobilization capabilities. Survey data indicated the four mainshaft bearing manufacturers for gas turbine engines could reach only 39% of the surge target (doubling production) after 12 months and fall short of the mobilization target (quadrupling production) by 50% after two years. This situation is expected to worsen in the next few years.

As the OEM's increase their use of foreign bearings, additional limits are placed on domestic firms' ability to respond to surge and mobilization. OEMs increased dependence on foreign sources can lead to interruption of supply during an emergency, placing our nations' defense posture in jeopardy.

Recommendations

The JBWG determined a two-pronged approach is necessary to improve the competitiveness of the domestic industry, ensure its long-term survival as well as ensuring

6. Study the impact of imports on US producers of bearing parts, components and steel. During the investigation the group noted the US infrastructure supporting the bearing industry was eroding and being replaced by imports.

The four actions for the Department of Defense are:

1. Initiate a time limited FAR for the procurement of domestic bearings for all DOD uses, providing exceptions and waivers which are within the Government's best interest. This will initially ensure domestic bearings for DOD applications.

2. Consolidate, coordinate, and increase funding for joint service/industry modernization programs for domestic bearing manufacturers.

3. Investigate DOD capabilities and industry needs for a projection of bearings requirements.

4. Examine refurbishment capacity within the commercial industry and determine the appropriate split between commercial and DOD refurbishment work loads.

The bearing industry is critical to national security. However, the industry is at risk and will experience a dramatic contraction if nothing is done. The US government must take decisive and immediate actions, including regulatory changes, legislative enactments, and clear administrative policy directions if a domestic production capability is to be maintained.

BACKGROUND

Mission

On November 29, 1985, Deputy Secretary of Defense William H. Taft, IV, tasked the Joint Logistics Commanders to undertake a study on the criticality of the domestic bearing industry (30 millimeter and larger) and to determine the impact of the industry on national security. The study was initiated in response to Congressional concerns over the availability of bearings in an emergency and the use of foreign manufactured bearings in US weapon systems.

The following tasks were to be addressed by the study effort:

Task 1. Assess the criticality of the domestic bearing industry to national defense.

Task 2. Assess the current strength and long term economic viability of the US bearing industry.

Task 3. Determine DOD and essential commercial requirements.

Task 4. Analyze the extent to which bearings of foreign manufacture are used in weapon systems and components procured by DOD.

Task 5. Assess the implications for readiness and sustainability of using bearings of foreign manufacture.

Task 6. Analyze the feasibility of restricting DOD to the use of bearings of US manufacture only.

In response to Deputy Secretary Taft's request, the Joint Logistics Commanders directed the Joint Group on the Industrial Base (JGIB) to conduct a national security assessment of the bearing industry. The JGIB, which includes representatives from the Army Materiel Command, the Air Force Systems and Logistics Commands, and the Chief of Naval Operations (Logistics), was originally established to provide guidance and direction and

and Roller Bearing Industry, authored by the Department of Commerce and the US International Trade Commission, respectively.

2. Data Requests for Service Requirements - The three Services and the Defense Logistics Agency tasked their appropriate field agencies to provide total bearing demand and requirement data (by weapon system where possible), part numbers, names of suppliers, etc., for the years 1983-1987.

3. Data Requests from Industry - Nine Major bearing manufacturers were surveyed by the Department of Commerce under authority of the Defense Production Act. The Working Group developed a questionnaire requesting information concerning shipments, production capacity, investment, foreign relationships, etc., to gain a better perspective of the bearing industry. The Working Group decided not only to survey bearing manufacturers but also end users (gas turbine engine, gearbox and machine tool manufacturers), and support industries such as steel producers, forging companies and ball manufacturers. A specific questionnaire was developed and sent to companies in each industry. Extracted tabular data for these industries and sample questionnaires are attached in Appendix D and E.

4. Industry Plant Visits - Members of the Working Group formed teams to visit selected companies in each industry. The industry site visits were made to reinforce the importance of the written survey, to expand on issues of importance, and to have personal exchanges with industry executives on the economic, financial, trade, and political issues facing the industry today and in the future.

but represent approximately 20 percent of total military consumption. The military consumes 60 to 70 percent of the dollar value of the total production of superprecision bearings and between 40 and 45 percent of the superprecision units. The remaining 80 percent of military bearing consumption is composed of precision and commercial/commodity grade bearings. The materials, equipment, and labor needed to produce commercial/commodity grade bearings do not present the same engineering problems associated with superprecision bearing grades. However, many of the precision bearings used in helicopters, tanks, ships, fixed winged aircraft, and accessory applications do present some of the same engineering and manufacturing problems encountered in producing the higher precision, or superprecision bearings.

Bearings are critical components in military weapon systems vital to a nation's ability to conduct modern warfare. The Industrial College of the Armed Forces report titled "Aircraft Engine Main Bearings", noted that during World War II, ball bearings became a bottleneck in Germany's efforts to increase armaments production because Allied bombing efforts were directed specifically at the destruction of German ball-bearing facilities. Therefore, dependence of DOD weapon systems on foreign produced bearings will cause a further weakening of the US industrial base and an erosion of our ability to provide the bearings used by the military and in essential commercial applications necessary for our national defense.

Task 2. Assess the current strength and long term economic viability of the US bearing industry.

The overall strength and competitiveness of the US bearing industry has been declining over the past few years. Major changes have taken place that are having a dramatic long term affect on the industry. Numerous takeovers and consolidations are symptomatic of these changes. Recent mergers and takeovers include: (1) Minebea (Japan) buyout of New Hampshire Ball Bearings, Inc.; (2) Ingersoll-Rand purchase of the Fafnir Bearing Company from Textron and for merger with its Torrington Bearing Company subsidiary; and (3) SKF Industries' (Sweden) offer to buy the MRC Bearings Division from TRW for merger with US operations. The Torrington-Fafnir consolidation will give Ingersoll-Rand (US corporation) 17 percent of the US market. The SKF-MRC consolidation will give SKF (foreign corporation) 32 percent (value; 11 percent of units) of the superprecision market in the US.

result was that dollar sales declined 19 percent in the over 2 inch roller bearing market despite an increase of over 30 percent in unit sales. In the smaller 0-2 inch size range both unit and dollar shipments increased by nine percent. This increase is due in large part to expanding sales of needle bearings which benefited from the import restraints on Japanese motor vehicles. Needle bearings are not currently affected by foreign competition. However, this could change if foreign firms turn their attention to this market.

The stability of the commodity sector of the bearing industry has deteriorated to the point where it now sits upon a precipice ready to collapse. If nothing is done by the Federal Government to reduce or eliminate the growing import share of the domestic market, the industry will almost certainly withdraw from more and more markets and jeopardize the maintenance of a defense capability.

Tables 14, 15 and 16 in Appendix D display measures of financial performance and employment in the commodity sector and compare it to the superprecision sector. The Tables underscore the severity of the bearing industry's inability to compete and paint a bleak picture for the future. Before tax, profits in the commodity sector fell from 7.2 percent in 1981 to a five year low of 1.4 percent in 1983, and then recovered partially to 5.1 percent in 1984, before declining again in 1985 to 3.4 percent. Because of increased foreign penetration into the US market, the bearing industry did not participate in the economic recovery that began in 1983.

Investment by the commodity sector declined as a percent of sales in each year from 1981 through 1985. The industry did not generate sufficient internal funds needed for new equipment and modernization. Investment per employee as well as per production worker also fell each year despite a 22 percent drop in employment between 1981 and 1985.

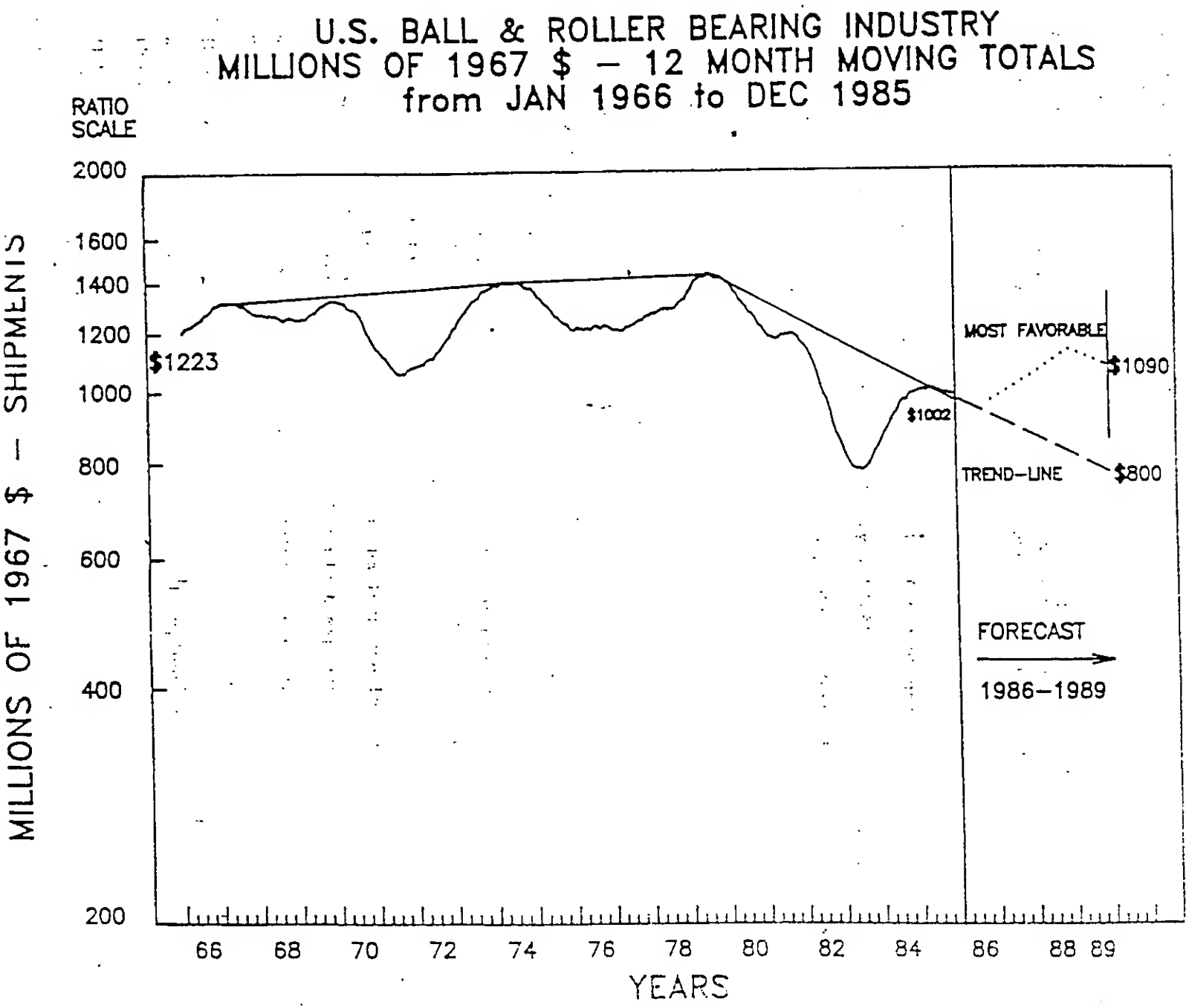
The 22 percent drop in employment amounted to over 10 thousand employees; from 46 to 35.7 thousand. Almost 97 percent of this decline involves production workers. Although the companies offered early retirement incentives to help reduce employment, they also released a substantial numbers of non-tenured, younger workers and failed to hire new workers during the period. This increased the average age of their work force. The companies also stepped up their foreign sourcing of parts and components which tended to lower their employment requirements.

Currently it is becoming more difficult to maintain tolerances required for efficient runs. Setup times increase and this contributes to a rise in overhead costs which are difficult to recoup over short production runs. Superprecision bearing companies have been reinvesting profits into their plants and equipment but not at a rate sufficient to upgrade their facilities to the levels necessary to keep up with improvements in technology. Profit margins are too low for them to make the required investment.

Computer numerically controlled (CNC) equipment has dominated new machine purchases for the last decade. Forty five percent of the new CNC turning and grinding machines are under five years of age and another 36 percent is under ten years of age. However, the total superprecision industry has only 121 of these machines and it is distributed among 10 companies.

The reluctance of bearing manufacturers to invest in capital equipment necessary for the production of all bearings has resulted in changes in company philisophy regarding future profitability. Major changes are expected to take place in the near future, including possible reduced plant operations and plant closures. As an example, New Departure Hyatt Bearings Division of General Motors announced on 24 April 1986 that it's non-automotive bearing division will be sold. The primary reasons for most of the management decisions to consolidate operations or close unprofitable plants are: a diminishing share of the domestic bearing market, and, a dim view of future prospects for the US bearing industry. It remains to be seen whether the more recent changes involving company mergers will be beneficial to the domestic bearing industry as a whole.

Two recent reports have been published that discuss the current strength and long term viability of the domestic bearing industry. The International Trade Commission report, USITC Publication 1797 of January 1986, entitled Competitive Assessment of the US Ball and Roller Bearing Industry contained a statement concerning the outlook for the domestic bearing industry that is pertinent to this study. It stated "...the maintenance of capacity however, may pose potential problems for current and future competitiveness. Investment has not only fallen considerably but must be used, at least to some degree, to maintain assets generating low rates of return. Costs imposed by the maintenance of capacity in lines of bearings that are increasingly uncompetitive in US and world markets, impede efforts of firms seeking to upgrade facilities that produce lines of bearings that


U.S. BALL & ROLLER BEARING INDUSTRY
MILLIONS OF 1967 $ – 12 MONTH MOVING TOTALS
from JAN 1966 to DEC 1985
RATIO SCALE
MILLIONS OF 1967 $ – SHIPMENTS
2000
1600
1400
1200
1000
800
600
400
200
$1223
$1002
MOST FAVORABLE
$1090
TREND–LINE
$800
FORECAST
1986–1989
66
68
70
72
74
76
78
80
82
84
86
88
89
YEARS

BEARING QUANTITIES, COSTS, AND NSNS

SERVICE	NSN	QUANTITY	DOLLAR VALUE
Army (AVSCOM)	443	4,397	5,487,333
Navy (ASO)	500	25,318	16,230,094
Navy (SPCC)	211	26,777	32,053,294
Air Force	150	38,146	15,402,470
DLA	205	50,235	25,408,138
Totals	1509	144,873	$94,581,329

As an additional estimate of DOD requirements, the DOC provided a forecast of defense demand for bearings using the DOD Defense Economic Impact Modeling System (DEIMS) and other available information. The total demand for bearings generated by US defense spending is estimated to average just over 17 percent of the total US bearing market for the period reviewed (1983-1987). In addition to bearing demands generated by domestic defense spending, foreign military sales (FMS) also create a demand for bearings. FMS demands are estimated to be an average of 1.5 percent of the total US market for bearings during the 1983-1987 period. With FMS, total defense related demand for ball and roller bearings averages just under 19 percent of the total market. This estimate includes:

1) direct purchases of bearings by the Department of Defense, primarily for use as spares or replacements;

2) indirect requirements which are bearing demands generated by prime contractors or their subcontractors, primarily for installation in new military equipment ordered by DOD;

3) military induced demands or the bearings required in the capital equipment needed to produce military items; and

4) demands for bearings created by foreign military sales (FMS).

A breakdown of estimated defense generated bearing requirements for the three major categories and the foreign military sales category is as follows:

The table below includes estimates of defense generated requirements for superprecision bearings for the period 1983-1987. The estimates are based on the survey questionnaire sent to bearing manufacturers for this assessment.

Estimated Defense Demand for Superprecision Bearings
ABEC or RBEC 5 and over
(millions of 1984$)

Size	1983	1984	1985	1986	1987
Ball Bearings					
Over 30-52 mm OD	13.0	14.5	14.2	15.7	17.0
Over 52-100 mm OD	23.4	28.2	28.1	30.1	32.5
Over 100 MM OD	18.3	19.5	19.3	21.5	23.2
	54.7	62.1	61.6	67.3	72.7
Roller Bearings					
Over 2-4" OD	16.9	16.1	18.8	19.6	21.1
Over 4-6" OD	14.0	12.6	13.6	15.2	16.4
Over 6" OD	14.5	12.8	15.6	16.2	17.5
	45.5	41.5	48.0	51.0	55.0
TOTAL	100.2	103.6	109.6	118.3	127.7

Projected Percent Superprecision Bearings of
Total Defense Market

17.9	17.5	18.3	17.9	17.9

Methodology for Determining Defense Demands

The estimates of defense generated demands for bearings were made by consolidating information from:

1) Department of Commerce Input/Output Model.
2) Department of Defense "Defense Economic Impact Modeling System" (DEIMS)
3) DOD Security Assistance Agency factbook on Foreign Military Sales.
4) various Department of Commerce statistical publications

superprecision bearings and total defense demands was then computed for each superprecision size range and projected for 1986 and 1987.

Task 4. Analyze the extent to which bearings of foreign manufacture are used in weapon systems and components procured by the DOD.

Foreign bearings and components are increasingly being used in DOD weapon systems. This trend has come about because of increasing leadtimes and higher prices for domestic bearings. Foreign bearings can be purchased that are sometimes one half the price of a comparable US manufactured bearing. The gas turbine engine manufacturers reported that their use of imported bearings for 1985 was not a significant factor. Two of the companies visited are now importing bearings for use in defense applications. The imported bearings represent 1.2% of total units and 2.3% of dollar receipt for bearings in 1983, and 2.2% of total units and 2.4% of dollar receipts for bearings in 1985. Only two of the companies reported data for 1981. One of the companies reported it was purchasing imported bearings for qualification purposes only, but it intends to use the source(s) for its requirements for these bearings in 1986 and beyond.

From 1981 to 1984 the Navy was 100% dependent on a Japanese source (NTN), for noise quiet superprecision bearings. In 1981, after capturing the entire noise quiet bearing market, NTN notified the Navy that, as a result of new internal company management policies, NTN was changing its NT-3 (noise quiet)bearing programs. As a result, leadtime for delivery of bearings would change from 180-210 days to 300-400 days effective immediately, and cost per bearing would be increased. Subsequently, NTN stated it was committed to continue as a supplier of Navy NT-3 bearings but would no longer maintain an inventory of NT-3 bearings. The price of NT-3 bearings would continue to increase and NTN would no longer provide price quotes or supply NT-3 bearings in small quantities. The Navy exerted significant effort to develop a domestic bearing manufacturing source to overcome this unsatisfactory dependency.

Under Title III of the Defense Production Act, the Navy, in 1984, guaranteed the purchase of $1 million of noise quiet bearings for one year. This was in addition to the cost of the product. The Navy was then able to contract with a domestic bearing company for the manufacture of noise quiet ball bearings. Two years of efforts have resulted in only one

Cheaper imports have been capturing the large volume, low technology/low cost larger order lots, forcing domestic producers into high cost smaller lots. The bearing companies all confirmed this trend, reporting that they are being driven to what they refer to as niches in the bearing market. The industry is very capital intensive, which makes it sensitive to low volume production. Smaller production runs reduce efficiency and lengthen investment paybacks, raising the cost of bearings produced. Historically, the US bearing industry has been based on long production runs and high volume production. Since they have lost most of their share of the high volume market the remaining low volume, small lot/niche type market is not suitable for most of their equipment and plant facilities. Using equipment that is more suitable for high volume manufacture on batch production runs is inefficient and costly, making the industry less competitive against foreign companies. As an indicator of how much the imports are penetrating the larger lot orders, one company representative noted that 65 percent of unit imports comprise 20 percent of the part numbers.

It is apparent that the US share of the commercial bearing market will continue to decline as foreign bearings increasingly penetrate the domestic market. The current trend is for an increasing use of foreign bearings in DOD weapon systems for cost, leadtime and performance reasons. The OEMs indicate they will continue to qualify and use more foreign bearings in their newly designed systems. This includes superprecision bearings for critical military applications. Therefore, the increasing dependence of DOD weapon systems on foreign produced bearings will cause an erosion of the US bearing industry resulting in an overall weakening of the US industrial base.

Task 5. Assess the implications on readiness and sustainability of using bearings of foreign manufacture.

The use of foreign bearings in weapon systems can have serious implications when determing readiness and sustainability for surge and mobilization. During these scenarios, any disruption in supplies of imported bearings would result in long procurement leadtimes and create shortages that could shut down production lines and/or limit the operation of critical weapon systems. Recent bearing shortages have caused grounding of our first line aircraft and line stoppage of M-1 tank production.

firms were told to maintain commercial shipments while increasing defense production to the maximum extent possible. Increases were reported at intervals of three, six and 12 months. The companies were told to surge within existing facilities and target a twofold increase in defense production in one year.

Under mobilization conditions, commercial shipments are dropped to 25 percent of their 1985 average. Companies were told to invest in new plant and equipment and target a fourfold increase in base line defense production in two years. Mobilization increases were reported at intervals of six, 12 and 24 months.

Overall, 40 percent of the firms surveyed were not able to meet surge targets and 50 percent were not able to meet mobilization targets. Table 11 in Appendix D shows the current surge and mobilization production capabilities for the superprecision bearing sector as a whole. Surge production increased by 16 percent after three months, 49 percent in six months and by 96 after one year. Superprecision ball bearings increased 18 percent, 50 percent and 93 percent in the time intervals, and superprecision roller bearings increased two percent, 40 percent and 117 percent after three, six and 12 months, respectively.

All four major engine main shaft bearing producers failed to meet surge, reaching only 39 percent of target. These same four also failed to meet mobilization, reaching only 50 percent of the target of four times production. The major bottlenecks to surge were grinding equipment, gauging equipment, equipment parts, rolling elements, material lead times and skilled labor. Floor space, defense order quantities and tight specifications were also mentioned.

Mobilization capabilities exceeded the target for the superprecision industry as a whole, increasing to 4.2 times baseline production after 24 months. The increase in mobilization production was 91 percent after six months and 203 percent after 12 months. Superprecision ball bearings missed targeted capabilities by 68 percent, with only a 232 percent increase after two years. The ball sector increased 82 percent in six months and 163 percent after one year. Superprecision roller bearings increased 148 percent after six months, 462 percent after 12 months and 898 percent after 24 months. Four of nine firms were able to reach mobilization target levels. Skilled labor, and machine tools are bottlenecks to mobilization.

The use of a government procurement regulation for over 30mm ball and roller bearings would help the domestic bearing industry recover by protecting the military segment of the domestic market. Meetings with bearing industry management provided solid support for this type of action. They believe this is the absolute minimum action that should be taken to help give the domestic bearing industry sufficient time to recover and become viable. If this regulation were to be imposed, it should also include the requirement to purchase all bearing components and parts which are domestically manufactured.

It should be noted that it will be necessary to issue a procurement regulation that will cover all bearings procured for military applications to ensure domestic production capability. To be effective, the regulation must apply to superprecision bearings, precision bearings, airframe and aircraft control bearings, and wheel bearings. The protection of only the superprecision bearings will not ensure the survival of the industry, since it represents only a small segment of the total bearing market. The Working Group has determined that the total military bearing usage, including all types of bearings, is only 17 percent of the total US bearing production. Therefore, to effectively assist the bearing industry, the total military segment must be addressed.

The gas turbine engine manufacturers that were visited also endorsed the issuance of a procurement regulation to require purchases of domestic bearings for weapon system application. Engine manufacturers voiced certain reservations concerning its potential effect on the OEMs. Prices for domestic bearings could rise in the short term, and there may be long term technological disadvantages due to exclusion of foreign suppliers. They concur that the bearing industry must modernize and become more efficient and competitive. The bearing industry must institute improved manufacturing techniques, modern CNC equipment, and improved management controls to become more responsive to the requirements of the OEMs.

Unless a government procurement regulation requires the purchase of domestically manufactured bearings for all military applications, the incursion of foreign bearings will eventually lead to the destruction of the domestic bearing industry, including the military segment. The subtier supply levels of the industry will also face severe contraction. The military segment, including the superprecision bearings, is dependent upon the survival of the larger commercial/commodity bearing market and could not survive on its own. If

PREVIOUS GOVERNMENT STUDIES SUMMARY

The bearing industry has been the subject of many studies in the past few years. Prior to this effort an investigation was made of available data on file with various government agencies. Several recent studies were reviewed by the Working Group and the following summary of information was extracted for inclusion in this report. This data supports and confirms our findings.

SPONSOR: Industrial College of the Armed Forces
TITLE: Aircraft Engine Main Bearings Study
DATE: May 1982

This study analyzed the availability of jet engine main bearings to support peacetime operations as well as future surge or mobilization requirements. The lack of these precision components will greatly impact the nation's ability to deploy, conduct, or sustain military operations.

Key issues such as technology, materials, requirements, manpower and quality control were examined as they related to the bearing industry in general, and to the Department of Defense (DOD) in particular. Pertinent facts and observations related to each area were highlighted and explained. The findings represented the culmination of extensive visits, briefings, tours, and discussions with engine and bearing manufacturers, engine overhaul facilities, engine/bearing management organizations, material suppliers, and forging facilities.

The study confirmed that engine bearings are critical assets which directly affect aircraft readiness rates and that the strategic airlift and tanker fleets face a far more serious problem than do other aircraft. The requirement for bearings to support these types of aircraft will rise as much as 500 percent during an intense conflict.

Although most bearings that are required for peacetime operating stocks are on hand, isolated shortages of one or more bearing types exist for several of our most modern and critical airlift and fighter aircraft. All services are experiencing similar problems with

The conclusion is that when market conditions dictate a necessity to invest in capital improvements to react to an expanding market, the companies in the bearing industry are not reluctant to act.

In foreign trade, exports have fluctuated between 8 and 10 percent of total US bearing manufacturers' shipments. Imports of bearings have grown steadily over the past fifteen years and they extensively and materially affect the ball bearings segment of the US market and are becoming a major factor in the roller bearings sector. Dominant overseas suppliers include Japan, Canada, and West Germany. Also, Singapore is rapidly expanding its influence in the US bearings import market. Free world trade in bearings by leading manufacturing countries tripled during the last 15 years. However, the US share of the world export market has dropped during the same period; Sweden and the United Kingdom have also lost market shares. West Germany's share increased as did those of Japan and France. Exports from Singapore, a new-to-market country, have also grown and significantly penetrated the US market for radial ball bearings in the under 30 millimeter size group. Soviet Bloc countries are expanding their presence in the world market. Romania, in particular has penetrated the US tapered roller bearing market.

Although US industry has some energy cost advantage and is comparable or superior in product technology, it continues to lose world market share because of higher labor and material costs. In addition, major foreign competitors concentrate their output on long-run, standard, and most profitable items, and are extremely price competitive in the US and Third World markets. US manufacturers have devoted a larger portion of their facilities to the production of short run, special purpose, and limited application bearings. Although some US firms are increasing their investments in advanced machinery and equipment, they may continue to lose their competitive position in the world market unless wages and material prices improve in relation to overseas competitors, and the exchange rate in the world market improves.

Revolutionary future technological developments which would give the US industry a greater competitive edge are not anticiapted. However, the United States is equal to or slightly ahead of world competitors in bearing technology. Generally, with bearings produced to international standards, the vast majority are interchangeable in world markets.

this information, JDMAG issued a data call to the Services. The Services' bearing materiel managers were requested to provide data for bearings costing $150.00 or more. The $150.00 was chosen because it approximated the cost of manpower and equipment needed to rework a bearing.

The Services identifed three bearing rework facilities in their reply. They are the Corpus Christi Army Depot, the Naval Air Rework Facility, North Island, and the Oklahoma City Air Logistics Center. These three facilities reworked 4,525 bearings with a cost of $150.00 or more. The bearings were disassembled, components inspected, parts replaced, or repaired as necessary, reassembled and returned to service. This effort saved the Services $1,273,542. The 4,525 bearings represent 30 percent of those bearings which were inducted for possible rework. The Services indicated that with better tooling and sufficient personnel the recovery rate would increase from 30 to 50 percent.

The Services detailed a number of reasons why more bearing rework is not accomplished. Their reply also identifed steps which are underway to eliminate these problems. Most bearings are identified in the DOD supply system as throw-away if they cannot be inspected and reused. Steps are underway to change the coding in the supply system for bearings to be returned to a depot facility for potential rework.

The Services reported a problem with the availabiltiy of the spare parts necessary to rework bearings. The original bearing manufacturers are reluctant to provide parts for the DOD rework effort; they prefer to sell new bearings. The Services are working through the Joint Bearing Repair Group to resolve this problem by obtaining the components necessary to refurbish bearings.

The Services reported that when the bearing refurbishment program is fully implemented at the three facilities, they will be able to rework and return to service approximately 30 percent of the 144,000 used bearings costing over $150 that are currently being replaced annually for cause by the DOD. This would mean 43,000 fewer new, high cost, replacement bearings would be purchased by the DOD from the domestic bearing industry.

profits, investment cutbacks, and loss of sales to increased imports of products containing bearings all weaken the domestic industry's long-term competitive strength. The US bearing industry, despite intense import competition, has maintained capacity, but utilization of capacity and investment has fallen drastically (See Table 8 and 9). US producers have been more affected by imports of low-value-added, mass-produced bearings than by imports of higher value-added superprecision bearings. US exports to most major world markets as well as overall industry employment declined during the January 1980-1985 time frame.

Major world markets were dominated by a small number of firms with Swedish, US, West German, and Japanese firms most prominent. West Germany's ball bearing industry is dominated by three large firms. This high degree of industrial concentration has not necessarily protected the industry, however, because West German production of bearings has declined in the past four years. By contrast, Japan's ball and roller bearing industry increased total production from 1980 to 1984, albeit modestly. Between 80 and 90 percent of its production in ball and roller bearings was accounted for by five producers. Exports to the US market have grown considerably. Japanese exports to the US increased from 28 percent in 1980 to 33 percent in 1983. Japanese firms have also augmented direct exports with the acquisitions of bearing plants in the United States. They also, accounted for the majority of bearings installed in products imported by the United States.

Severe import competition recognition occurred initially in the high-volume OEM market, but now it is increasing at the distributor level. Japan, the principal supplier of US imported bearings, increased its share of US imports from 28 percent in 1980 to 46 percent in 1984 and to 49 percent during January-June 1985. West Germany was the second leading supplier but its share of the US import market declined from 17 percent in 1982 to 16 percent in 1984. Other significant suppliers included Canada and Singapore. During this period, Canada's share of the US import market ranged from a low of 9 percent during January-June 1985 to a high of 12 percent in 1983.

Data obtained by respondents to the commission's questionaires indicated that 12 US ball bearing producers and 7 US roller bearing producers have started to import bearings, in response to the increased competition in the US market from other imported ball and

INDUSTRY SURVEY SUMMARY AND COMMENTS

This section contains a summary of the information gathered from the industry surveys and visits. Each contains a synopsis of comments to the survey questionnaires and discussions during the plant visits. Recommendations are strictly the views of the companies visited and are not to be considered as opinions of the Working Group.

BEARING COMPANIES

Nine bearing companies responded to the Department of Commerce mandatory survey. In addition, three other firms submitted completed surveys voluntarily. These firms represent a substantial portion of the industry. The overall market share (compared with Bureau of the Census data) attributable to the eleven reporting firms ranged from a high (in dollars) of 62 percent in 1981 and 1982 to a low of 56 percent in 1984 (the latest year available). The unit share ranged from a high of 41 percent in 1981 to a low of 35 percent in 1984. All of the superprecision sector was represented by the survey.

Nine of the responding firms produce superprecision bearings. They were requested to report their superprecision bearing capacity (in units) by size range. Tables 8 and 9 in Appendix D show a tabulation of capacity and capacity utilization by size range and firm. Almost 89 percent of the capacity to produce superprecision bearings is represented by ball bearing capacity. The dominance of ball bearing capacity in the superprecision sector is related to the predominance of high speed applications, especially in the small end of the size ranges. Over 50 percent of the ball bearing unit capacity is comprised of bearings in the smallest size range, 30-52 mm. If capacity were translated to dollar value, superprecision ball bearing capacity would be slightly over 60 percent, as roller bearings are on the average considerably more expensive.

Table 9 in Appendix D includes information on unused capacity and rev-up time. Unused capacity totals 1.5 million units or nearly half of total superprecision capability. This low utilization is in part due to foreign penetration into the commercial applications of superprecision bearings as well as a slump in commercial end markets such as aerospace and machine tools. The decline in units delivered to commercial markets between 1981 and 1985 amounted to 10 percent in the superprecision ball market and 47 percent in the superprecision roller bearing market (see Table 3. Appendix D).

The bearing plant visits included interviews with the top management of each of the bearing companies, and walk-throughs of their manufacturing facilities. The visits were intended to support the assessment objectives by determining: (1) the importance of a domestic bearing production capability to US defense requirements; (2) the connection, if any, between a viable commercial/commodity bearing production base and the maintenance of the defense related bearing production base capabilities; (3) the key problems confronting the bearing industry including the effects of foreign competition; (4) the future outlook for the bearing industry; and (5) the company recommendations for assuring the continued existence of a US bearing industry.

The following analysis of the information obtained during the bearing industry visits represents a composite bearing industry position as viewed by the study team members and is not necessarily the position of any specific bearing company. There is a wide divergency of opinion within the bearing industry as to the problems facing the industry and possible solutions which can be applied to specific situations. The bearing industry is often divided by differing goals and objectives. The domestic bearing companies that are foreign owned and operated have different views than the companies that are US owned and operated.

1. BEARING INDUSTRY OUTLOOK: The need for a strong bearing industry was constantly emphasized in all of the meetings with company executives. They referred to World War II and the concerted efforts that the Allied forces expended to try to destroy the German bearing manufacturing plants. It was also pointed out that a major bearing plant had to be built in this country in 1942 to manufacture superprecision bearings for use in the Norden bombsight. In the event of similar emergency bearing requirements in the future, there would not be sufficient time to build the bearing plants and develop the needed manufacturing capability to produce the necessary bearings to meet all military requirements. The companies believe the US bearing industry is an extremely important part of this country's industrial and military strength.

Comments of company officials concerning the International Trade Commission report of January 1986 indicated they felt the report did not fully describe the general state of the US bearing industry. They believe the problems facing the domestic companies were not adequately addressed, nor the gravity of the situation regarding foreign competition emphasized.

Most of the companies expressed a concern over competition with foreign bearing companies in the world market. In the Japanese domestic market, even if US prices were competitive, Japanese trade restrictions preclude US firms from competition. The Japanese companies will not buy from US bearing companies regardless of price, as long as there is a Japanese product available. They will buy from the US only those bearings that they are unwilling/unable to manufacture. With respect to the European Economic Community, it is difficult to sell US manufactured bearings. This is due to a rising spirit of nationalism which encourages buying products from companies located in their own countries. Again, sales are made by some companies to the EEC of special kinds of bearings that are not currently made in Europe.

Competition with foreign bearing companies in the US market has it's own set of problems. Many of the foreign bearing companies are located in geographic areas that pay very low wages. The result is companies located in these low labor cost areas have a significant advantage over bearings that are manufactured in the US. US companies provide extensive technical sales and after-sales services that foreign manufacturers only marginally provide (See Table 13, Appendix D). These overhead costs must be added to the cost of the bearings by domestic firms. In response to foreign competition's reluctance to provide such services, some domestic manufacturers have eliminated these overhead costs completely to remain competitive. This then impacts the OEMs ability to acquire cost-free technical assistance when required and ultimately drives cost to the end user up..

The bearing companies expressed a concern that the US trade laws and regulations are either not adequately enforced, or when enforced, do not carry with them sufficient penalties to deter unfair trade practices. They all expressed the need for the government to vigorously enforce the existing trade laws regarding dumping on the part of foreign companies and to do so in a timely manner. They felt the US government has not been responsive to the degree necessary to prevent or reduce the practice of dumping bearings in the US market. The bearing companies also had reservations concerning licensing agreements that allowed foreign manufacturers access to specialized US bearing technology. This has hurt the US bearing industry by transferring important technology to a foreign base, where it can then be used to compete with domestic bearing manufacturers.

NOTE

These actions will have a negative impact on the companies by reducing their ability to respond to customer needs, and impair their future competitiveness through fewer new product developments.

f. Companies are moving many of their manufacturing operations to the Southern States where there are lower labor costs and the labor forces are nonunion.

g. Many of the bearing companies are implementing statistical process control programs (SPC) in their plants to improve bearing quality and reduce scrap rates. The extent of SPC in the bearing industry varies from a hand entry tracking method, to a fully computerized tracking system that is part of a totally integrated management control system.

h. A few companies are developing and implementing a fully integrated computerized management control system that will bring together all of their manufacturing operations and management functions.

i. Some bearing companies are currently importing foreign produced soft-turned bearings rings (unfinished) and semi-finished retainers in order to reduce costs and allow them to remain competitive against low cost foreign bearings.

The following list shows some of the parts that are currently being imported from overseas sources:

corresponding increase in the cost of domestically manufactured bearings, making them less competitive. Most of the companies indicated they would favor a national policy that would develop domestic sources for all materials used in the manufacture of ball and roller bearings. These companies are currently importing foreign steel to meet specific requirements of quality and/or price. The following table shows the current use of foreign steel by domestic bearing companies:

STEEL TYPE	PERCENTAGE OF USE
AISI 52100	6
AISI 52100	48
AISI 52100	3
AISI 52100	50
AISI 52100	26
AISI 440C	25
AISI 3310	95

5. GOVERNMENT PROGRAMS: Most of the companies were not familiar with government financial assistance programs such as IMIP (formally known as Tech Mod) that are intended to provide incentives for industrial modernization and product improvement and lower costs. Two companies are currently participating in this program and are enthusiastic about the results. The IMIP program is being used to develop a domestic source for noise quite bearings and eliminate US dependence on foreign bearings for a critical application. Four companies said that the IMIP (Tech Mod) program would help them modernize so they could effectively compete against foreign producers.

Some of the companies indicated they would be reluctant to participate in the IMIP program if they had to share all the technology they had gained during the development of the project with other US bearing companies. They did not feel that this kind of program would have any significant effect on their ability to regain competitiveness with foreign bearing companies.

The bearing companies were interested in acquiring new technology that would impact their manufacturing capabilities. Many of these technologies require extensive

Two companies indicated they would perform the work in the same manner the government rework facilities do. They would perform both the more limited, lower cost, Level II "Refurbishment", and the in-depth, Level IV "Remanufacture" procedure. Some companies would be willing to rework another manufactuer's bearings, while others expressed reluctance to try to rework bearings other than their own, due to different designs and internal configurations.

7. RATIONALIZATION: Some of the bearing companies suggested the US bearing industry should rationalize production in a manner similar to the Japanese. The effect of rationalization among US companies would be to maximize production runs, lowering production costs, and ultimately would result in US bearings becoming more competitive with foreign bearings. US bearing companies realize this cannot be attempted without major revisions to existing anti-trust laws. Other company officials took the position that rationalization might work if anti-trust laws were changed, and an umbrella organization was established to oversee its implementation.

8. RECOMMENDED GOVERNMENT ACTIONS: Not all of the bearing companies had the same view of what it would take to preserve or protect the US bearing industry, and make it more competitive, however, there was a concensus on many actions. This section contains recommendations made by the companies. The following recommendations were endorsed by all of the companies visited:

a. The government should implement a procurement regulation that would require the purchase of domestically manufactured bearings for all military applications.

NOTE

They indicated the regulation must apply to all bearings and not just to superprecision bearings.

b. The federal government should vigorously pursue improving timely enforcement of its existing trade regulations and laws, including anti-dumping actions. New regulations should be enacted to provide more deterents and to prevent violations.

a. Change the anti-trust laws to allow the US bearing industry to rationalize product lines.

b. Establish and implement a national plan to develop domestic production sources for all materials used in the manufacture of ball and roller bearings.

c. Increase the use of IMIP to help the domestic bearing industry modernize and become more efficient and cost effective.

d. Reduce the number of plant audits that are conducted by the different OEMs and government agencies, by consolidating the audits under the jurisdiction of a common agency.

delay in deliveries of a critical component from the United Kingdom during the Falklands crises, pointing out the high probability of interruption in supply from a foreign source.

In concert with this philosophy, the OEMs feel that maintaining the technology base of the domestic bearing industry is also important as they continue to utilize domestic sources for bearings. A domestic manufacturing capability is necessary to the continued technological advancement and product development of bearings. Company product engineers expressed their belief that engines of the future will operate at even faster speeds and higher temperatures. To keep pace with these trends, domestic bearing manufacturers must continue to devote resources to product research and development. One company official stated that most of the major product advances in the past ten years have been initiated by domestic producers. Foreign firms now appear to be devoting more resources to product development to the extent that the past ten years may not be indicative of the future. In spite of this, a strong domestic bearing industry is crucial to product development because of the ever increasing sophistication of engines.

The firms were asked if requirements for bearings could be reduced without sacrificing the performance of defense engine systems. In every case, firms responded that substitution of parts or reduction of specifications is not possible, especially for safety of flight. Additionally, as engines become more sophisticated, specifications will become even more stringent. All said tolerances and requirements are already relaxed as much as possible, and there are no requirements that could be relaxed for mobilization/surge conditions.

Interviews with engine company executives respecting the problems facing the US precision bearing manufacturers, showed a generally pessimistic outlook. The major problem areas which surfaced during discussions included increasing lead times, escalating prices, aging equipment, declining quality, qualification procedures, and stagnant product research and development. Some company executives mentioned the difficulties experienced by bearing companies which are part of a multi-layered conglomerate. As part of a conglomerate, a bearing company is only a small contributor to overall corporate revenues and as such is considered a relatively unimportant business segment. Since profits in bearing companies have been low, they have been unable to finance reinvestment as well as maintain research operations.

	F100	#2.4 Mainshaft; 4 Gearbox
	TF30	#1 Mainshaft; 7 Gearbox
	TF33	#5 Mainshaft; 1 Gearbox
	F404	4 Mainstaft
	F110	2 Mainshaft; 13 Gearbox
SNFA	F409	1 Mainshaft
NTN	LM1600	Gearbox
	T700/CT700	50% of Mainshaft bearings
SNECMA	F108	4 Mainshaft; 13 Gearbox

Company officials reported that the price of super precision bearings in support of defense programs is increasing. This is another factor causing OEMs to seek alternate sources for bearings. Respondents who indicated they are in the process of qualifying foreign sources cited price as a primary factor. Other reasons included superior quality, shorter leadtime, and more sensitivity to the needs of the manufacturer. A foreign firm, FAG Kugelfisher Georg Schafer KG, has been approved as a source by six OEMs; a French firm, SNFA-SA, has been approved as a source by three OEM's

Most companies have a policy of retaining a domestic source of supply for precision bearings even if foreign sources are utilized, to ensure continuity, particularly in time of surge or mobilitzation. As noted above, a major trend to develop mulitiple sources, including foreign firms, is becoming widespread in the industry. Competition with other prime engine contractors to lower prices is also a driving force. Though the present policy is to maintain both a domestic source for precision bearings as well as a foreign supplier, some companies indicated that while a domestic source will be qualified, production orders may go only to a foreign supplier. They stated that the volume of business is not large enough to warrant having more than one active producer. Survey data reveals that the number of foreign sources has risen six-fold from two firms in 1980 to twelve firms by the end of 1985. Another 150 percent increase in foreign sourcing to a total of thirty firms is planned by 1990. The table below illustrates the increasing trend toward use of foreign sources.

As an indicator of OEM involvement with foreign businesses, the survey requested information on participation in joint ventures or other arrangements with foreign firms. Two companies reported agreements with foreign firms which impact the domestic industry. One company is part of a joint venture with a European producer of gearboxes which will have European bearings. Another has entered into a European co-production agreement for newly developed commercial engines. European sources will also provide specific precision engine bearings as well as gearbox bearings.

Of the recommendations mentioned below by the OEMs the major emphasis was directed toward issues protecting the bearing industry from foreign competition. During discussions with company executives, they all agreed trade restrictions could lead to increased prices for their products because of the use of more domestically produced bearings, which are currently much higher in price than foreign bearings. A FAR which would require that only domestic parts and components be used in defense products would cause their product price to rise. This would also affect foreign military sales as well as DOD prices. If the OEM's were allowed to purchase foreign produced superprecision bearings, prices for bearings would decrease. Some superprecision bearing prices charged by foreign producers were quoted to be $1500 less than the same bearing being produced by a domestic firm. One company executive estimated that on the average bearings represent approximately $20,000 for a $1,000,000 engine. A $1500 reduction in price can lead to a savings of $150,000 on sales of 100 engines.

Some of the OEM's believed that protecting the bearing industry could have a negative effect on modernization. Protectionism would benefit the bearing industry but perhaps create an atmosphere of complacency and foster less initiative to invest in state of the art equipment and improvements in production processes to stay competitive with their foreign counterparts. The OEM's felt any plan of this sort must include an incentive for self investment. There would have to be some consideration given to revision of the Competition in Contracting Act, since the price of domestically produced bearings would be less competitive.

The survey asked the OEM's to provide recommendations to help the bearing industry and the responses were many and varied. The following is a list of their recommendations.

engines in the DOD inventory will need a supply of bearings for many years considering the current decisions for budget trimming and the DOD history of using weapon systems at least 10 years. These used bearings would be subject to limited use and be scheduled for removal after a certain period of time.

6. Stockpile bearings for mature weapon systems with the major portion of these bearings being stockpiled for weapon systems projected to remain in use for the longest period of time.

7. The federal government could enter into agreements with bearing producers to allow them to buy machine tools for the production of commercial high volume bearings but capable of producing superprecision bearing part. This would enhance surge capability and both the company and the government would benefit in the long run.

8. Encourage machine tool companies to develop machinery that will reduce setup time. Machinery centers capable of being computer programmed to machine different processes for different parts will enhance productivity, reduce inventory, reduce leadtimes and cut costs.

9. Undertake a more aggressive campaign to encourage the use of IMIP. This program could be used to encourage machine tool development for the industry. Also, increase funding in the program to allow broader use of the program. Other areas which would be beneficial to the bearing producers through IMIP are inspection, inspection automation, manufacturing process equipment, and manufacturing equipment improvement.

10. Urge the machine tool industry to be more sensistive to the needs of the bearing industry. Perhaps machines could be produced that would require less modification at the bearing producers plants. If machine tool companies and bearing producers are closely involved in development, better tool control, which would reduce the extent to which on-site tool modification would be necessary, would lead to improved productivity.

STEEL MANUFACTURING AND FORGING COMPANIES

Production of bearing grade steel is generally a batch process. Steel manufacturers, in order to recognize the economies of facility utilization, will accumulate orders to schedule a minimum melt. This lends itself to producing for inventory against orders currently on the order book or, in some cases, an accepted history of customer requirements. A limiting factor in the production of bearing grade steel might include the availability of a raw material such as chrome. Current steel capacity exists in the industry to react favorably to increased requirements for bearing quality steel.

Some steel producers export bearing quality steel to offshore customers causing them concern over DOD plans requiring all bearings to be domestically produced. They feel some of their overseas customer deliveries might be suspended. Increased steel production in the early 1980's spurred capital investment in the industry, especially in the aircraft bearing grades. Steel production in some companies, especially the Carpenter Technology Corporation, undertook a $400M expansion based on increased volume. Currently, production of specialty steels peculiar to the precision and superprecision bearing industry is adequate and they have the ability to increase that capability. The grades necessary for the production of commercial bearings (not precision) have eroded to no domestic source due to foreign competition (aisi 52100VD). Some of the steel producers feel any protectionist measures taken to help the bearing industry would cause foreign competitors to simply turn capacity to non-protected areas and would cause more harm than good. Protectionist measures should be directed at encouraging development of new technology and maintaining that technology in the US. Steel producers feel that current laws against dumping are not enforced in the US.

While only one forging company was visited and three surveyed, it was felt the company visited was representative of the industry. The company has realized a 30 percent loss in sales over the past few years due to the effects of foreign competition. There was no observable recent capital investment in the plant. The company would prefer to not have to compete for defense related business. The plant is currently working at approximately 65 percent capacity, company officials estimate their surge or mobilization capability at 40 percent more than current production.

MACHINE TOOL COMPANIES

Questionnaires were sent to selected machine tool manufacturers concerning the use of domestic and foreign bearings in domestically produced machine tool equipment. Two companies responded to the survey and a summary of their combined replies are provided.

The combined annual usage of precision bearings by the two companies surveyed amounted to $1,175,000. Most of these bearings were supplied by seven domestic bearing manufacturers.

Foreign bearings amount to between 4.2 and 15 percent of the total bearing requirements for machine tools and their use is increasing due to lower prices and shorter leadtimes as compared to domestic bearings. Most foreign bearings used for machine tools are supplied by the domestic bearing manufacturers acting as the middleman. Often foreign bearings are used instead of domestic bearings because of superior state-of-the-art technology, although the manufacturers want to maintain domestic sources in the event foreign supplies are interrupted.

The machine tool manufacturers believed the primary reason that US bearing companies are not competitive is their higher cost. Less productive manufacturing equipment as well as higher labor and inventory costs all contribute to this higher cost. Most foreign bearing companies are government subsidized which is another reason for lower prices.

Machine tool manufacturers provided recommendations on how the government could help the domestic bearing industry. These include:

1. Provide an economic stimulus in the form of investment capital for new plants, equipment, and more research and development.

2. Ensure that foreign bearing sources do not dump their products in the US market.

3. The government should provide the bearing companies adequate protection against unfair foreign competition through establishment of quotas and other import restrictions.

GOVERNMENT PROGRAMS

Department of Defense programs are available to aid manufacturers in maintaining production capabilities. These include Title III of the Defense Production Act (DPA) of 1950, the Industrial Modernization Incentives Program (IMIP), Bearing Refurbishment (Rework) by manufacturers or contractors, and the Competition in Contracting Act (CICA) which offers opportunities for domestic competition.

TITLE III DEFENSE PRODUCTION ACT

One of the specific goals of the Defense Production Act is to provide financial assistance for expansion of productive capability to facilitate the production of goods and services necessary for national security. Title III of the Defense Production Act of 1950 contains provisions for assistance programs. One provision, purchase commitments, is already in use; others should be evaluated for their effectiveness in upgrading the bearing industry to capacity production in the event of surge or mobilization. Title III of the Act addresses expansion and supply, allowing the President to make provisions for loans to private business for the expansion of capacity, the development of processes or the production of essential material for defense. The Act states in SEC 303. (a) "...the President may make provisions for purchases of or commitment to purchase ...materials, for government use..." and in SEC 303 (e) "When in his judgment it will aid the national defense the President is authorized to install Government owned equipment in plants, factories, and other industrial facilities owned by private persons."

As indicated above the act makes funding possible for a variety of applications. Congress has limited DOD to only allow purchase commitments, however purchase commitments yield the most obvious return on investment, as hard goods are received for monies expended. Investments made through the other sections of the act are not as easy to justify by this criteria. It is precisely in the other areas that the greatest help to the bearing industry could be rendered.

Utilization of these alternate Title III provisions would help ensure the maintenance of a viable domestic industrial base for bearings. Purchase commitments are not enough of an investment to cure the problems of this industry in the long run. Loans for plant

or processes; and result in detailed implementation plans and cost-benefit analyses. Development of the required technology will be performed as required to obtain the necessary expertise.

Phase III: Implementation: The lead contractor and the team member bearing companies will integrate the results of Phase II into production.

There are currently two bearing companies participating in IMIP.

1. The San Antonio Air Logistics Center at Kelly Air Force Base currently has an IMIP project with the Fafnir Bearing Division of Torrington Bearing Company. This two year project involved the expenditure of $2,000,000 of Air Force funds that were matched by Fafnir funds. This project is directed at improving the manufacturing operations at Fafnir's New Britain, CT plant by developing the cellular concept of manufacture. Fafnir is currently in Phase II of the project.

2. TRW Bearings has completed a Phase I tasking at a cost of $500,000 to review their overall manufacturing operations. This has led to a Phase II contract.

The Aeronautical Systems Division of Air Force Systems Command (AFSC) at Wright-Patterson Air Force Base is currently developing a larger IMIP project with the aircraft engine bearing industry. This project is intended to address a large segment of the bearing industry and will also include some of the prime engine manufacturers to keep them actively involved in the program. It is anticipated that Phase I of the AFSC bearing industry IMIP will be contracted by early summer 1986.

Some of the bearing companies that were visited were unaware of IMIP but showed interest in participating in the program. Some of the companies indicated a reluctance to participate if the developed technology, including what they considered proprietary, had to be shared with other bearing companies. One company felt that the two year experience gained during the conduct of the project gave them a sufficient advantage to offset the data exchange.

The IMIP is a good example of a way the government can assist the bearing industry to help itself. The government funds are small compared to the matching bearing company

Level III: Regrind: All of the Level I operations and the following additional operations:

1. Grind the raceways of the inner and outer rings
2. Design and manufacture a new retainer
3. Manufacture new oversize rolling elements

Level IV: Remanufacture: All of Levels I and II operations and the following additional operations:

1. Save the most expensive ring and hone the raceways as necessary
2. Manufacture new rolling elements, retainer, and inner ring

NOTE

Level IV maintains all of the original internal and external dimensions and operating parameters of the manufacturer.

The Services are currently establishing this bearing rework capability at three separate sites: 1. Navy: Naval Rework Facility North Island; 2. Army: Corpus Christi Army Depot; and 3. Air Force: Tinker Air Force Base.

The primary purposes of the bearing rework program is to save money and to provide an alternate source for critical bearings used in aeronautical applications. The monetary savings accrue as a result of rework costs that are significantly less than the replacement cost for new bearings.

The Services are currently involved in a JLC Joint Bearing Repair Group effort to increase the reuse of precision bearings by refurbishing them on a large scale at the three Service facilities. This potentially includes up to 43,000 bearings annually over $150 for 1500 different stock numbers. The number of bearings being removed from the new procurement requirements being bought by the Services from the bearing companies, would take a significant percentage of their already diminishing business.

There would have to be an assurance of an adequate market before many of the companies would become interested in expending their own funds, to develop the capability. However, there was one company that was willing to begin reworking bearings immediately to fill its unused capacity.

Most of the bearing companies were only interested in performing Level IV Remanufacturing, which is the highest cost approved bearing rework procedure. The service's bearing refurbishment program involves Level II, which is a lower cost, limited rework procedure, involving honing of the raceways, replacement of the rolling elements, and the repair/replacement of the retainer. Two bearing companies were very interested in performing Level II refurbishment in conjunction with Level IV Remanufacture.

The military's plan to fully implement its bearing refurbishing program would be detrimental to an already threatened bearing industry. If the bearing industry is willing and able to accomplish the necessary bearing rework functions, the services should utilize bearing company facilities. The military's bearing rework program was established to save a significant amount of money, and to develop an organic capability to be able to rework bearings in emergency situations. The service's capability could be maintained by limiting their bearing rework to emergency and/or extreme shortage situations, while utilizing the bearing manufacturers for the normal/high volume rework function.

COMPETITION IN CONTRACTING ACT

The Competition in Contracting Act (CICA) requires full and open competitive bidding and award to the lowest bidder. The Act has often been cited as a detriment to the preservation of our domestic industrial base. The emphasis on the lowest cost component or system has often allowed foreign vendors to gain the upper hand in defense procurements. This does not have to be the case. Competition can be encouraged but limited to domestic manufacturers. The act allows for seven exemptions to full and open competition and Exception 3, limits production to the industrial base to ensure its maintenance. Once the exception is invoked all subcontracts and vendors are also limited to domestic sources. This requires time and energy as well as money to be accomplished but is a workable and existing solution to maintaining domestic sources and capabilities.

- Replacement of lost or diminished manufacturing capability would require leadtimes of several years.

- Foreign bearing sources cannot be regulated or controlled by the US government to meet urgent requirements.

Task 6

- A government procurement regulation requiring the use of domestic bearings for military applications will:

1. Have to be applied to all bearings used in military applications.
2. Help ensure domestic sources for military applications.
3. Contribute to the survival of the US bearing industry.
4. Not ensure the survival of the bearing industry as a whole.
5. Possibly contribute to complacency on the part of the bearing industry.
6. Not address all of the problems facing the US bearing industry.
7. Not prevent foreign manufacturers from dominating the commercial market.

Summary of Conclusions

1. The bearing industry needs to invest more capital in new plants and equipment to become more competitive with foreign manufacturers. The bearing industry must invest more money in research and development projects to stay competitive with foreign manufacturers.

2. Government assistance programs such as IMIP and Title III, if adequately funded could help the bearing industry modernize and become more competitive.

3. There are trade related problems facing the bearing industry that can only be addressed through enforcement and/or changes in US trade laws and regulations.

4. There is a need for a national policy to develop and maintain a domestic capability to produce all materials and parts necessary for the manufacture of bearings.

5. There is a need to establish an interagency group to address trade and economic issues such as: dumping, tariffs, quotas; and tax incentives and low interest loans for plant and equipment modernization. This panel should consist of experts in the areas of trade and economic policy, federal procurement policy, and international relations.

RECOMMENDATIONS

The following recommendations have been developed by the Working Group to address the problems and issues that are now facing the US bearing industry. They are intended to: (1) provide solutions that can be immediately applied to the problems that must be solved to prevent the further erosion of the bearing industry: and (2) propose solutions to resolve the long term issues that must be resolved to ensure the survival and the continued viability of the bearing industry.

SHORT TERM These recommendations can be initiated by the DOD and will provide immediate relief to the bearing industry.

1. Supplement existing FAR to require for new designs for all defense applications, purchase of only domestically manufactured bearings (should not apply to existing design applications not currently available from domestic producers). Exceptions and waivers will be provided based on existing agreements (foreign government) within the best interest of the Federal Government. However, the intent is to provide domestic manufacturers the opportunity to develop capability to produce all defense bearings.

a. The regulation would apply to all DOD direct and indirect (contractor, OEMs, etc.) purchases of all types of ball (including spherical monoball), roller bearings, airframe and aircraft control bearings.

b. All of these bearing and bearing parts shall be manufactured in the US (within the definition of domestic end product as specified by FAR).

c. No unfinished or semi-finished foreign parts will be used in the manufacture of bearings for the DOD.

d. The FAR should be in effect for a limited period of time, at least five years. This would allow the bearing industry time to dedicate a portion of profits gained during this period toward modernization of facilities and equipment, and work force training programs.

Trade Issues:

1. Consider limiting bearing imports temporarily, combined with domestic producer plans for facility modernization and workforce training programs. This would allow a limited time period for the industry to expand market share and increase profits. Concurrently, through Government/Industry agreements, a minimum portion of these profits would be dedicated for plant and equipment modernization.

2. Evaluate industry concerns regarding existing anti-dumping regulations and evaluate their ability to discourage dumping and unfair trade practices. Consideration should be given to implementing actions that would control the "unfair" trade penetration (predatory pricing and cartels) of foreign bearings in the US bearing market.

3. Review industry concerns regarding existing anti-trust laws as they affect the bearing industry. Investigate a temporary exemption from anti-trust laws to allow industry the opportunity to consolidate bearing lines and rationalize production. Major foreign markets have already allowed this process to occur and have realized production and competitive efficiencies.

4. Analyze current US and foreign tariffs and quotas on bearing parts, components, and steel. This will encourage domestic subtier suppliers to reestablish manufacturing capacity to support the increased demand for bearing parts, components and specialty steels.

Economic Issues:

1. Evaluate the need and benefit of low interest loans to the bearing industry that would help obtain the necessary capital to build new plants and purchase new equipment. There is an urgent need for the aging bearing industry to modernize and become more competitive in the domestic and world markets, and to improve the quality of the product.

2. Evaluate the need and benefit of establishing an investment tax credit program for the domestic bearing industry that would help modernize plants and purchase new CNC equipment that is needed to become more efficient and improve the quality of bearings.

APPENDIX A
JBWG MEMBERS

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MR AUGUST PRITZLAFF.....	AMXIB-IA US ARMY
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MR MICHAEL D. MEAD.....	NAVAIRSYSCOM 536A1 US NAVY
MR EDWARD PURCELL.....	NAVAIR 51411 US NAVY
MR MICHAEL A. WHITMORE.....	NAVSEA 907 US NAVY
MR EDWARD GRAHAM.....	DISC-PRI DEFENSE LOGISTICS AGENCY
MR BRAD BOTWIN.....	ITA/OIRA US DEPARTMENT OF COMMERCE
MR JOHN TUCKER.....	ITA/OIRA US DEPARTMENT OF COMMERCE
MR WILLIAM E. FLETCHER.....	ITA/CAPITAL GOODS AND INTERNATIONAL CONSTRUCTION US DEPARTMENT OF COMMERCE
MS CARLA SPRINGER.....	OFFICE OF INDUSTRY/MACHINERY AND EQUIPMENT US INTERNATIONAL TRADE COMMISSION

APPENDIX C

LETTERS AND CONGRESSIONAL RECORD EXCERPT

FROM: House of Representatives Report 99-332, 24 Oct 85

SOURCES OF BALL BEARINGS

High precision ball bearings are a necessity in the manufacture of jet engines and other high technology devices. The Committee is concerned over availability of ball bearings, and over the possible use of ball bearings of foreign manufacture in critical weapons systems and components. The Committee directs the Department to study and report not later than June 30, 1986 on this subject. The report is to include: an assessment of the criticality of the ball bearing industry to national defense; an assessment of the current strength and long term economic viablity of the U.S. ball bearing industry; an analysis of the extent to which ball bearings of foreign manufacture are used in weapons systems and components procured by DOD; an assessment of the implications for readiness and sustainability of using ball bearings of foreign manufacture; and,

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APPENDIX D

STATISTICAL DATA

Table 1. Unit Shipments of Ball and Roller Bearings by Size and Grade for Non-Defense and Defense Applications as Reported by Eleven Firms

	Non-Defense Shipments, Units (000s)				
	1981	1982	1983	1984	1985
BALL BEARINGS					
Commodity Grade					
0-30mm (1+)	13920.6	10290.6	9512.4	10689.5	9494.1
30mm+ (1 & 3)	76488.3	56985.7	64048.3	73704.9	61120.1
Super Precision					
30-52mm (5+)	414.9	438.9	368.2	410.0	469.1
52-100mm (5+)	398.0	303.3	258.4	286.5	270.2
100mm+ (5+)	76.3	54.3	49.7	58.1	57.6
Tot. SuperPrec.	889.2	796.5	676.3	754.6	796.9
Total Ball	91298.1	68072.8	74237.0	85149.0	71411.1
ROLLER BEARINGS					
Commodity Grade					
0-2" (1+)	177623.0	144078.6	178876.4	210244.2	194049.8
2" (1 & 3)	117865.5	92882.4	109443.3	128775.3	157311.8
Super Precision					
2-4" (5+)	62.8	43.7	31.1	35.6	29.7
4-6" (5+)	16.9	13.2	9.7	11.2	9.5
over 6" (5+)	6.9	7.8	5.9	5.0	6.9
Tot. SuperPrec.	86.6	64.7	46.7	51.8	46.1
Total Roller	295575.1	237025.7	288366.5	339071.3	351407.7
TOTAL	386873.2	305098.5	362603.4	424220.3	422818.8

	Defense Shipments, Units (000s)				
	1981	1982	1983	1984	1985
BALL BEARINGS					
Commodity Grade					
0-30mm (1+)	6639.3	5845.0	5029.6	5203.7	4219.9
30mm (1 & 3)	3115.8	2408.7	2215.7	2242.6	1957.2
Super Precision					
30-52mm (5+)	263.6	375.9	337.6	351.1	368.3
52-100mm (5+)	251.0	203.6	166.2	178.6	176.8
100mm+ (5+)	85.6	43.6	39.6	39.2	42.4
Tot. SuperPrec.	600.2	623.1	543.4	568.9	587.5
Total Ball	10355.3	8876.8	7788.7	8015.2	6764.6
ROLLER BEARINGS					
Commodity Grade					
0-2" (1+)	2140.2	1780.3	1875.7	1895.1	2185.4
2" (1 & 3)	7297.9	5396.4	5338.2	6606.2	6344.1
Super Precision					
2-4" (5+)	92.4	89.0	75.2	66.3	87.4
4-6" (5+)	33.2	33.5	29.1	23.7	26.1
over 6" (5+)	13.5	12.5	12.1	9.9	13.2
Tot. SuperPrec.	139.1	135.0	116.4	99.9	126.7
Total Roller	9577.2	7311.7	7330.3	8601.2	8656.2
TOTAL	19932.5	16188.5	15119.0	16616.4	15420.8
Total Industry	406805.8	321287	377722.4	440836.6	438239.7

Table 3. Unit Ratios Showing Changes in Non-Defense and Defense Shipments (1981=1)

Non-Defense Shipments

	1981	1982	1983	1984	1985
BALL BEARINGS					
Commodity Grade					
0-30mm (1+)	1.00	0.74	0.68	0.77	0.68
30mm+ (1 & 3)	1.00	0.75	0.84	0.96	0.80
Super Precision					
30-52mm (5+)	1.00	1.06	0.89	0.99	1.13
52-100mm (5+)	1.00	0.76	0.65	0.72	0.68
100mm+ (5+)	1.00	0.71	0.65	0.76	0.75
Tot. SuperPrec.	1.00	0.90	0.76	0.85	0.90
Total Ball	1.00	0.75	0.81	0.93	0.78
ROLLER BEARINGS					
Commodity Grade					
0-2" (1+)	1.00	0.81	1.01	1.18	1.09
2" (1 & 3)	1.00	0.79	0.93	1.09	1.33
Super Precision					
2-4" (5+)	1.00	0.70	0.50	0.57	0.47
4-6" (5+)	1.00	0.78	0.57	0.66	0.56
over 6" (5+)	1.00	1.13	0.85	0.72	0.99
Tot. SuperPrec.	1.00	0.75	0.54	0.60	0.53
Total Roller	1.00	0.80	0.98	1.15	1.19
TOTAL	1.00	0.79	0.94	1.10	1.09

Defense Shipments

	1981	1982	1983	1984	1985
BALL BEARINGS					
Commodity Grade					
0-30mm (1+)	1.00	0.88	0.76	0.78	0.64
30mm (1 & 3)	1.00	0.77	0.71	0.72	0.63
Super Precision					
30-52mm (5+)	1.00	1.43	1.28	1.33	1.40
52-100mm (5+)	1.00	0.81	0.66	0.71	0.70
100mm+ (5+)	1.00	0.51	0.46	0.46	0.50
Tot. SuperPrec.	1.00	1.04	0.91	0.95	0.98
Total Ball	1.00	0.86	0.75	0.77	0.65
ROLLER BEARINGS					
Commodity Grade					
0-2" (1+)	1.00	0.83	0.88	0.89	1.02
2" (1 & 3)	1.00	0.74	0.73	0.91	0.87
Super Precision					
2-4" (5+)	1.00	0.96	0.81	0.72	0.95
4-6" (5+)	1.00	1.01	0.88	0.71	0.79
over 6" (5+)	1.00	0.93	0.90	0.74	0.98
Tot. SuperPrec.	1.00	0.97	0.84	0.72	0.91
Total Roller	1.00	0.76	0.77	0.90	0.90
TOTAL	1.00	0.81	0.76	0.83	0.77
Total Industry	1.00	0.79	0.93	1.08	1.08

Table 5. Unit and Dollar Defense Market Shares of Ball and Roller Bearings from 1981 to 1985, Reported by Eleven Firms (as percent of total shipments)

(percent unit shares)

	1981	1982	1983	1984	1985
BALL BEARINGS					
Commodity Grade					
0-30mm(1+)	32.29	36.22	34.59	32.74	30.77
30mm+(1 & 3)	3.91	4.06	3.34	2.95	3.10
Super Precision					
30-52mm(5+)	38.85	46.13	47.83	46.13	43.98
52-100mm(5+)	38.67	40.17	39.14	38.40	39.55
100mm+(5+)	52.87	44.55	44.37	40.25	42.40
Tot.SuperPrec.	40.30	43.89	44.55	42.98	42.44
ROLLER BEARINGS					
Commodity Grade					
0-2" (1+)	1.19	1.22	1.04	0.89	1.11
2" (1 & 3)	5.83	5.49	4.65	4.88	3.88
Super Precision					
2-4" (5+)	59.54	67.07	70.74	65.06	74.64
4-6" (5+)	66.27	71.73	75.00	67.93	73.31
over 6"(5+)	65.98	61.43	67.06	66.44	65.84
Tot.SuperPrec.	61.97	67.02	70.92	65.91	72.56
Tot.Industry	4.90	5.04	4.00	3.77	3.52

(percent dollar share)

	1981	1982	1983	1984	1985
BALL BEARINGS					
Commodity Grade					
0-30mm(1+)	40.06	42.64	42.54	39.04	35.78
30mm+(1 & 3)	5.50	6.25	6.43	5.85	6.19
Super Precision					
30-52mm(5+)	43.23	47.56	47.92	46.88	45.08
52-100mm(5+)	47.14	53.96	55.88	59.01	60.55
100mm+(5+)	55.76	56.79	55.32	53.01	54.96
Tot.SuperPrec.	49.68	53.10	53.59	53.86	54.51
ROLLER BEARINGS					
Commodity Grade					
0-2" (1+)	24.26	28.75	25.93	24.30	24.80
2" (1 & 3)	8.38	8.54	8.13	9.91	9.89
Super Precision					
2-4" (5+)	58.45	65.45	69.93	66.22	70.60
4-6" (5+)	66.37	70.72	73.23	67.92	72.12
over 6"(5+)	65.25	68.32	70.25	67.27	68.97
Tot.SuperPrec.	63.47	67.63	70.17	67.01	69.36
Tot.Industry	13.38	15.85	15.95	15.20	15.95

Table 7. Average Price Ratios Showing Changes in Non-Defense and Defense Prices (1981=1)

	Non-Defense Average Price Ratios				
	1981	1982	1983	1984	1985
BALL BEARINGS					
Commodity Grade					
0-30mm(1+)	1.00	1.25	1.35	1.36	1.52
30mm+(1 & 3)	1.00	1.09	0.96	0.93	0.95
Super Precision					
30-52mm(5+)	1.00	1.07	1.16	1.21	1.12
52-100mm(5+)	1.00	1.08	1.24	1.18	1.17
100mm+(5+)	1.00	1.08	1.17	1.17	1.08
Tot.SuperPrec.	1.00	0.98	1.11	1.12	1.02
Total Ball	1.00	1.11	1.01	0.98	1.02
ROLLER BEARINGS					
Commodity Grade					
0-2" (1+)	1.00	0.95	0.89	0.91	0.99
2" (1 & 3)	1.00	0.94	0.71	0.76	0.60
Super Precision					
2-4" (5+)	1.00	1.20	1.48	1.46	1.66
4-6" (5+)	1.00	1.22	1.43	1.45	1.50
over 6"(5+)	1.00	1.00	1.50	1.63	1.46
Tot.SuperPrec.	1.00	1.27	1.66	1.59	1.82
Total Roller	1.00	0.93	0.72	0.76	0.72
Tot. Non-Def.	1.00	0.98	0.79	0.81	0.76

	Defense Average Price Ratios				
	1981	1982	1983	1984	1985
BALL BEARINGS					
Commodity Grade					
0-30mm(1+)	1.00	1.17	1.34	1.28	1.36
30mm(1 & 3)	1.00	1.20	1.33	1.34	1.37
Super Precision					
30-52mm(5+)	1.00	0.94	0.97	1.04	0.97
52-100mm(5+)	1.00	1.34	1.73	1.93	1.95
100mm+(5+)	1.00	1.57	1.62	1.74	1.60
Tot.SuperPrec.	1.00	0.97	1.09	1.18	1.14
Total Ball	1.00	1.16	1.31	1.36	1.50
ROLLER BEARINGS					
Commodity Grade					
0-2" (1+)	1.00	1.20	1.01	0.85	0.91
2" (1 & 3)	1.00	1.02	0.87	1.10	1.11
Super Precision					
2-4" (5+)	1.00	1.17	1.49	1.60	1.42
4-6" (5+)	1.00	1.16	1.30	1.44	1.41
over 6" (5+)	1.00	1.32	1.68	1.81	1.64
Tot.SuperPrec.	1.00	1.20	1.51	1.61	1.47
Total Roller	1.00	1.18	1.11	1.13	1.18
Total Defense	1.00	1.16	1.21	1.24	1.33

Table 10. 1985 Market Shares in Units and Dollars for Super Precision Bearings

Firm	(000s) Unit Shipments	Percent of Market	Dollar Shipments	Percent of Market	(000s) Average Price
a.	274	18	25,410	14	93
b.	23	1	2,940	2	129
c.	273	18	28,681	16	105
d.	131	8	40,308	22	308
e.	478	31	26,676	15	56
f.	13	1	13,027	7	1,002
g.	219	14	6,351	3	29
h.	102	7	21,003	12	206
i.	45	3	17,573	10	395
Totals	1,557	100	181,969	100	117

Table 11. Surge and Mobilization Capabilities

		(factor increase—base times x)					
		——Surge——			——mobilization——		
Size Range	base	3 mo	6 mo	12 mo	6 mo	12 mo	24 mo
Ball Bearings (ABEC 5 and over)							
over 30-52 mm O.D.	35.95	1.18	1.51	1.94	1.91	2.76	3.42
over 52-100 mm O.D.	34.65	1.21	1.53	1.95	1.77	2.55	3.29
over 100 mm O.D.	5.20	1.07	1.27	1.65	1.58	2.24	2.86
Total Ball	75.80	1.18	1.50	1.93	1.82	2.63	3.32
Roller Bearings (RBEC 5 and over)							
over 2-4 inch O.D.	7.94	1.01	1.33	1.78	2.11	4.55	7.80
over 4-6 inch O.D.	2.21	1.02	1.26	1.97	2.47	5.52	9.51
over 6 inch O.D.	1.70	1.07	1.90	4.28	4.22	10.78	20.72
Total Roller	11.85	1.02	1.40	2.17	2.48	5.62	9.98
Total Ball and Roller	87.65	1.16	1.49	1.96	1.91	3.03	4.22

Note: Base is average monthly defense production in 1985.

Table 13. Comparison of Competitive Factors between the United States and Selected Other Countries based on U.S. Bearing Company reports

	Competitive Viability			
Competitive Factor	U.S.	Japan	W.Germany	France
Price	4.3	1.4	2.9	3.4
Quality	2.3	1.8	1.9	3.6
Labor Costs	4.2	1.3	2.8	3.0
Capital Costs	3.2	1.2	2.5	3.7
Steel Costs	3.8	1.2	2.8	3.1
Delivery	2.0	2.2	2.3	3.7
Follow up service	1.2	3.1	2.4	4.2
Design capability	1.3	2.5	2.3	3.8
Engineering	1.2	2.8	2.0	4.2
Customer satisfaction	1.5	2.5	2.4	3.7
Trade barriers	4.8	1.1	2.8	2.7
Government supports	4.8	1.3	3.1	2.4

Competitive factor	U.K.	Sweden	Italy	Singapore/ Thailand
Price	3.8	3.0	3.0	1.0
Quality	2.0	3.0	4.5	2.0
Labor Costs	2.0	3.0	2.0	1.0
Capital Costs	3.6	3.3	2.5	1.0
Steel Costs	2.7	4.0	1.5	2.0
Delivery	3.3	4.0	3.5	2.0
Follow up service	3.0	3.0	4.5	4.0
Design capability	2.3	3.0	4.5	5.0
Engineering	3.3	3.0	4.0	5.0
Customer satisfaction	2.7	3.0	4.5	4.0
Trade barriers	3.0	3.3	3.5	2.0
Government supports	2.7	2.3	3.5	3.0

Note: 1 equals most competitive and 5 equals least competitive.

Table 15. Investment by the Commodity/Commercial Bearing Sector Compared with the Super Precision Bearing Sector

Commodity Sector
(in $000s)

Line Item	1981	1982	1983	1984	1985
Plant	$17,903	$19,982	$3,342	$10,504	$13,444
Mach. and Equipment	196,447	141,902	100,461	102,633	84,774
Total	$213,350	$161,884	$103,830	$113,137	$98,218
percent inv/net sales:	6.93	6.68	4.27	3.74	3.31
Inv./Employee	$4,664	$4,322	$3,102	$2,947	$2,755
Inv./Prod. Wker.	$5,348	$5,125	$3,652	$3,438	$3,261

Super Precision Sector
(in $000s)

Line Item	1981	1982	1983	1984	1985
Plant	$ 802	$ 454	$ 491	$ 433	$ 2,622
Mach. and Equipment	10,288	6,012	5,418	10,862	12,128
Total	$11,090	$6,466	$5,909	$11,295	$14,750
percent inv/net sales:	4.24	2.56	2.48	4.42	5.63
Inv./Employee	$1,949	$1,313	$1,350	$2,327	$3,067
Inv./Prod. Wker.	$2,547	$1,710	$1,640	$3,134	$4,029

Table 16b. Employment Ratios for the Commodity/Commercial Bearing Sector Compared with the Super Precision Bearing Sector (1981=1)

Commodity Sector

Employment	1981	1982	1983	1984	1985
Production Workers	1.00	.79	.71	.82	.75
Other Employees	1.00	1.00	.86	.93	.94
All Employees	1.00	.81	.73	.84	.78
		(in $000s)			
Sales/Employee	1.00	.96	1.08	1.17	1.23
Sales/Prod. Wker.	1.00	.99	1.11	1.19	1.27

Super Precision Sector

Employment	1981	1982	1983	1984	1985
Scientists & Engineers	1.00	1.07	1.01	1.07	1.03
Production Workers	1.00	.87	.76	.83	.84
Other Employees	1.00	.80	.77	.90	.82
All Employees	1.00	.87	.77	.85	.85
		(in $000s)			
Sales/Employee	1.00	1.12	1.18	1.15	1.18
Sales/Prod. Wker.	1.00	1.11	1.21	1.18	1.19

TABLE 17b DEFENSE PRECISION BEARING RECEIPTS AS REPORTED BY 9 OEMS

	1981		1983		1985	
RADIAL BALL BEARINGS	UNITS	DOLLARS	UNITS	DOLLARS	UNITS	DOLLARS
ABEC 5 and Over						
OVER 30-52 MM OD	14,850	1,396,300	23,875	3,219,375	25,848	4,015,812
OVER 41-100MM OD	8,235	1,450,283	20,425	4,772,439	24,622	5,984,345
Over 100-170MM OD	2,059	1,278,414	5,940	4,493,000	4,345	3,447,902
Over 170MM OD	674	737,900	1,927	3,376,897	2,131	3,297,143
TOTAL	36,462	6,008,771	56,192	18,272,260	72,996	22,558,198
ROLLER BEARINGS						
RBEC 5 and Over						
OVER 2-4" OD	7,087	2,984,544	15,519	3,515,502	21,352	5,101,330
OVER 4-6" OD	5,947	6,419,679	11,062	11,895,662	10,285	9,914,560
OVER 6" OD	912	1,025,531	2,328	3,174,058	2,401	3,390,700
TOTAL	42,682	12,929,325	47,729	22,423,138	83,814	23,515,931
TOTAL	79,144	18,938,096	103,921	40,695,398	156,810	46,074,129

BLE 17d DEFENSE PERCENT OF TOTAL PRECISION BEARINGS PURCHASED BY OEM's SURVEYED AS REPORTED BY 9 EOMs

	1981		1983		1985	
RADIAL BALL BEARINGS	UNITS	DOLLARS	UNITS	DOLLARS	UNITS	DOLLARS
ABEC 5 and Over						
OVER 30-52 MM OD	54.24	35.66	52.93	48.38	62.66	61.30
OVER 52-100MM OD	35.81	26.28	50.92	49.67	66.40	64.30
OVER 100-170MM OD	90.74	87.37	83.50	86.40	79.22	80.37
OVER 170MM OD	41.55	33.71	3.99	47.50	47.28	45.58
TOTALS PERCENT	56.17	42.22	38.83	58.97	69.94	67.96
ROLLER BEARINGS						
RBEC 5 and Over						
OVER 2-4" OD	36.92	48.78	44.58	42.94	61.75	57.50
OVER 4-6" OD	90.28	89.35	82.68	85.32	86.69	86.40
OVER 6" OD	28.09	22.45	46.93	43.27	2.34	61.17
TOTAL PERCENT	73.89	63.47	66.31	67.33	42.19	75.86
TOTAL	64.52	54.73	47.96	63.30	51.75	71.77

APPENDIX E

QUESTIONAIRES

Form ITA-9053
(2-86)

U.S. Department of Commerce
International Trade Administration

OMB Approval Not Required: less than ten respondents

NATIONAL SECURITY ASSESSMENT OF THE PRECISION BEARINGS INDUSTRY

Ball and Roller Bearings 30 mm and Larger and ABEC or RBEC 5 and Over

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THIS REPORT IS REQUIRED BY LAW

This report is required by law (50 U.S.C. App. Sec. 2155). Failure to report can result in a maximum fine of $1,000 or imprisonment up to one year, or both. Information furnished herewith is deemed confidential and will not be published or disclosed except in accordance with Section 705 of the Defense Production Act of 1950, as amended (50 U.S.C. App. Sec. 2155).

General Instructions

1. It is not our desire to impose an unreasonable burden on any respondent. IF INFORMATION IS NOT READILY AVAILABLE FROM YOUR RECORDS IN EXACTLY THE FORM REQUESTED, FURNISH ESTIMATES AND DESIGNATE BY THE LETTER "E". Any necessary comments or explanations should be supplied in the space provided or on separate sheets attached to this questionnaire. Ensure that you reference the proper question if you use extra sheets. If any answer is "none", please indicate.
2. Report calendar year data, unless otherwise specified in a particular question. Please complete Parts II and III separately for each of your establishments that produce precision bearings in the United States. Please make photocopies of forms if additional copies are needed. For Parts I, IV and V, firms operating more than one establishment may combine the data for all establishments into a single report.
3. In addition to the original report form to be returned to us, there is enclosed a file copy for your records. You are not legally required to fill out or retain this file copy. While it would be a convenience to the Government for a file copy to be made and retained for reference purposes, no assurances can be provided that file copies are exempt from compulsory examination pursuant to legal process.
4. Questions related to the questionnaire should be directed to Mr. Dave Stanley, Supervisor Materials Engineer (619) 437-6711, Department of the Navy, Major Terry Gower, Senior Program Analyst (513) 257-2622, Department of the Air Force, or Mr. Bill Fletcher, Industry Specialist (202) 377-0309, Department of Commerce.
5. Before returning your completed questionnaire be sure to sign the certification and identify the person and phone number to contact your firm.
6. Return completed questionnaire by March 18, 1986 to:

U.S. Department of Commerce
International Trade Administration
Office of Industrial Resource Administration
Attn: Brad Botwin, Program Manager for
Industrial Capabilities, Room H3876
Washington, D.C. 20230

FIRM IDENTIFICATION

1. Name and address of your firm or corporate division.

_____

_____

_____

If your firm is wholly or partly owned by another firm, indicate the name and address of the parent firm and extent of ownership.

_____

_____

_____

2. Identify the location of your precision bearing manufacturing establishment(s) in the United States. (See definition of precision bearing.)

	Locality	State	Zip Code
(a)	_____	_____	_____
(b)	_____	_____	_____
(c)	_____	_____	_____
(d)	_____	_____	_____
(e)	_____	_____	_____

3. Identify U.S. manufacturing establishments in which you ceased precision bearing production since 1980 and the reason production was stopped.

_____

_____

_____

_____

_____

_____

PART I - B. NON-DEFENSE SHIPMENTS (DOLLARS)

Enter total Non-Defense dollar shipments of precision bearings as indicated below (all manufacturing establishments). See definition of shipments.

	(in thousands of dollars)				
	1981	1982	1983	1984	1985
Radial Ball Bearings (including self-aligning)					
Below 9-30 mm O.D. (ABEC 1 and over))	____	____	____	____	____
Over 30 mm O.D. (ABEC 1 and 3)	____	____	____	____	____
ABEC 5 and Over					
Over 30-52 mm O.D.	____	____	____	____	____
Over 52-100 mm O.D.	____	____	____	____	____
Over 100-170 mm O.D.	____	____	____	____	____
Over 170-240 mm O.D.	____	____	____	____	____
Over 240-580 mm O.D.	____	____	____	____	____
Over 580 mm O.D.	____	____	____	____	____
Roller Bearings					
0-2" O.D. (RBEC 1 and over)	____	____	____	____	____
Over 2" O.D. (RBEC 1 and 3)	____	____	____	____	____
RBEC 5 and Over					
Over 2-4" O.D.	____	____	____	____	____
Over 4-6" O.D.	____	____	____	____	____
Over 6-8" O.D.	____	____	____	____	____
Over 8-10" O.D.	____	____	____	____	____
Over 10" O.D.	____	____	____	____	____

PART I - D. DEFENSE SHIPMENTS (DOLLARS)

Enter total Defense dollar shipments of precision bearings as indicated below (all manufacturing establishments). See definition of shipments.

	(in thousands of dollars)				
	1981	1982	1983	1984	1985
Radial Ball Bearings (including self-aligning)					
Below 9-30 mm O.D. (ABEC 1 and over))	____	____	____	____	____
Over 30 mm O.D. (ABEC 1 and 3)	____	____	____	____	____
ABEC 5 and Over					
Over 30-52 mm O.D.	____	____	____	____	____
Over 52-100 mm O.D.	____	____	____	____	____
Over 100-170 mm O.D.	____	____	____	____	____
Over 170-240 mm O.D.	____	____	____	____	____
Over 240-580 mm O.D.	____	____	____	____	____
Over 580 mm O.D.	____	____	____	____	____
Roller Bearings					
0-2" O.D. (RBEC 1 and over)	____	____	____	____	____
Over 2" O.D. (RBEC 1 and 3)	____	____	____	____	____
RBEC 5 and Over					
Over 2-4" O.D.	____	____	____	____	____
Over 4-6" O.D.	____	____	____	____	____
Over 6-8" O.D.	____	____	____	____	____
Over 8-10" O.D.	____	____	____	____	____
Over 10" O.D.	____	____	____	____	____

2. Enter below factors which would increase/decrease figures given above. (e.g. material, length of production run, etc.)

_____

_____

_____

3. What was this establishment's practical capacity utilization rate in percent during 1985?

Practical Capacity Utilization: Precision Bearings ____%

Other Bearings ____%

How long would it take to reach practical capacity from the rate indicated? (in weeks)

Precision Bearings ____weeks

Other Bearings ____weeks

4. Enter workforce shift information below.

Operation	Average shifts during 1985 # shifts	man hours/ shift	days/wk	Number shifts if at practical capacity # shifts	man hours/ shift	days/wk
Boring, Grinding and Turning						
Heat Treating						
Polishing/Lapping						
Calibration and/ Inspection						
Assemoly						
Testing						
Other						

5. Briefly discuss the convertibility of your non-defense production operations to defense production and the problems that might arise in the conversion.

_____

_____

_____

B. SURGE CAPABILITY

1. What is your precision bearing surge capability? (Use 1985's defense production and product mix for the precision bearing size ranges shown on the table below as your base production rate. In estimating your precision bearing surge capability, assume any other bearing production in this establishment for defense is also surged. Maintain non-defense production at 1985 levels. See definitions of surge capability and shipments.)

(monthly rates in thousands of units)

Size Range	1985's average monthly defense production rate	Surge rate at 3 months	Surge rate at 6 months	Surge rate at 12 months
Ball Bearings				
ABEC 5 and Over				
Over 30-52 mm O.D.	_____	_____	_____	_____
Over 52-100 mm O.D.	_____	_____	_____	_____
Over 100-170 mm O.D.	_____	_____	_____	_____
Over 170-240 mm O.D.	_____	_____	_____	_____
Over 240-580 mm O.D.	_____	_____	_____	_____
Over 580 mm O.D.	_____	_____	_____	_____
Roller Bearings				
RBEC 5 and Over				
Over 2-4" O.D.	_____	_____	_____	_____
Over 4-6" O.D.	_____	_____	_____	_____
Over 6-8" O.D.	_____	_____	_____	_____
Over 8-10" O.D.	_____	_____	_____	_____
Over 10" O.D.	_____	_____	_____	_____

MOBILIZATION CAPABILITY

1. What is your mobilization capability for precision bearings? (Use 1985's defense production and product mix for the precision bearing size groups shown on the table below as your base production rate. In estimating your precision bearing mobilization capability, assume any other bearing production in this establishment for defense is also mobilized. Non-defense production falls to 25 percent of 1985 levels. See definitions of mobilization capability and shipments.)

Size Range	1985's average monthly defense production rate (monthly rates in thousands of units)	Mobilization rate at 6 months	Mobilization rate at 12 months	Mobilization rate at 24 months
Ball Bearings				
ABEC 5 and Over				
Over 30-52 mm O.D.	_____	_____	_____	_____
Over 52-100 mm O.D.	_____	_____	_____	_____
Over 100-170 mm O.D.	_____	_____	_____	_____
Over 170-240 mm O.D.	_____	_____	_____	_____
Over 240-580 mm O.D.	_____	_____	_____	_____
Over 580 mm O.D.	_____	_____	_____	_____
Roller Bearings				
RBEC 5 and Over				
Over 2-4" O.D.	_____	_____	_____	_____
Over 4-6" O.D.	_____	_____	_____	_____
Over 6-8" O.D.	_____	_____	_____	_____
Over 8-10" O.D.	_____	_____	_____	_____
Over 10" O.D.	_____	_____	_____	_____

PART III - INVESTMENT, TECHNOLOGY, RESEARCH AND DEVELOPMENT, EMPLOYMENT AND SUPPLIERS.

INSTRUCTIONS

- o Complete Part III for each establishment that manufactures precision bearings.
- o If information is not readily available from your records in exactly the form requested, furnish estimates and designate by the letter "E".
- o Enter "none" where appropriate.

ESTABLISHMENT IDENTIFICATION

(Locality)	(State)	(Zip Code)

---

1. Investment: Enter expenditures for new plant, machinery, and equipment from 1981 through 1985 as requested below. Enter any government investment expenditures at your establishment separately.

Private Investment Expenditures
(in thousands of dollars)

	1981	1982	1983	1984	1985
Plant	____	____	____	____	____
Machinery and Equipment	____	____	____	____	____
Total:					

Government Investment Expenditures
(in thousands of dollars)

	1981	1982	1983	1984	1985
Plant	____	____	____	____	____
Machinery and Equipment	____	____	____	____	____
Total:					

2. Planned expansion: Enter percentage increase(+)/decrease(-) in practical production capacity planned for in the time frames indicated.

	Change in Capacity	Cost of Change	Description and Reason for Change
In one year	____	____	_____
In two-three years	____	____	_____
In over three years	____	____	_____

Capital Equipment Used For Making Raceways

	Age of Capital Equipment			
	0-4 yr.	5-9 yr.	10-19 yr.	20yr & up
Metal Cutting				
Numerical Control Turning Machines				
a) Horizontal, Under 9"	____	____	____	____
b) Horizontal, Over 9"	____	____	____	____
Numerical Control Grinding Machines	____	____	____	____
Internal Honing (inc. comb. bore-hone)	____	____	____	____
External Honing	____	____	____	____
Metal Forming				
Numerical Control Punching Machines	____	____	____	____
Non Numerical Control Punching Machines (inc. comb. punch-shear)	____	____	____	____
Mechanical Presses (except Forges)	____	____	____	____
Hydraulic Presses (except Forges)	____	____	____	____
Forge Presses	____	____	____	____
Other Equipment				
Heat Treating Furnaces- batch	____	____	____	____
continuous	____	____	____	____
Assembly Equipment	____	____	____	____

Government sponsored programs:

a. Are you currently involved in a Government sponsored modernization program respecting your precision bearing manufacturing operations? yes _____, no _____

b. How beneficial do you feel Government sponsored modernization programs are?

_____

_____

c. Will they result in reduced lead times? _____
Will they lower production costs? _____
Will they lower precision bearing prices to DOD? _____
Will they help you compete on the world market? _____

d. What problems still exist that these programs do not address? _____

_____

_____

e. In which of the following areas do you consider the application of new technologies to be most critical? Number from one (the most critical) to seven (the least critical).

Boring, Grinding and Turning	_____	Assembly	_____
Heat Treating	_____	Testing	_____
Polishing/Lapping	_____	Other(specify)	_____
Calibration and/ Inspection	_____		

f. List and rank specific new technologies you would be most interested in acquiring.

_____

_____

Employment: Enter the number of employees from 1981 through 1985 as requested below. (See definition of Scientists and Engineers, and Production Workers)

	1981	1982	1983	1984	1985
Scientists and Engineers	____	____	____	____	____
Production Workers	____	____	____	____	____
Administration and Others	____	____	____	____	____
Total:					

9. For the following parts/components used in the manufacture of precision bearings [illegible] and give the location of your top five domestically produced sources of supply and percentage of the total parts/components purchased from each. (See page 19 for foreign suppliers.)

	Balls/Rollers	Retainers/Cages	Forgings
a.			
b.			
c.			
d.			
e.			

10. What percent of your work did you subcontract out (rather than make yourself) in the past five years?

	1981	1982	1983	1984	1985
a. Balls/Rollers	____	____	____	____	____
b. Retainers/Cages	____	____	____	____	____
c. Forgings	____	____	____	____	____

Specify the manufacturing operations most frequently subcontracted.

_____

_____

11. Have you in the past five years experienced shortages or extended leadtimes in obtaining any material or supply, machinery, equipment, or additional labor that forced you to modify or curtail your operations?

yes _____, no _____

If yes, list below. Identify the nature and duration of the problem on your operation and the action you took to resolve the situation.

_____

_____

_____

PART IV - FOREIGN RELATIONSHIPS / FOREIGN SOURCING
(Part IV may be completed for your firm as a whole)

1. Enter the location and primary activity of any establishment outside the United States your firm wholly or partly owns or controls or is affiliated with or has license agreements with that manufactures precision bearings or bearing parts/components.

Name	Country	Primary Activity

2. If any of the foreign establishments you listed above are integrated with your U.S. operations on a normal basis, please briefly specify the nature of that integration the space provided below.

3. If the foreign establishments that you interact with suddenly ceased operations for indefinite period, what adjustments would you need to make in your U.S. operations counteract this interruption, how long would it take to establish a new source, and how would the interruption effect your surge and mobilization capabilities?

4. For the following parts/components used in the manufacture of precision bearing identify your top five foreign suppliers, the percentage of the total parts/ components purchased from each, and country of origin.

	Balls/Rollers	Retainers/Cages	Forgings
a.			
b.			
c.			
d.			
e.			

6. (continued)

A. No known domestic source
B. Domestic source not available or inadequate
C. Offset Agreement
D. Lower cost
E. Quicker delivery
F. Better quality
G. Other (specify)

Item	Country of Origin	For equipment Are spare parts/maintenance available only from a foreign source?	Reason why foreign source

7. If the foreign sourced items identified in question 6 are lost, what is your contingency plan (i.e. qualified domestic source, alternate material) and does this impact your ability to surge or mobilize?

8. In recent years, have offset agreements affected your firm?

_____yes _____no

If yes, how (cite examples)? _____

4. How do you view the competitive prospects for your firm's U.S. precision bearings operations over the next five years?

They should:
- improve greatly _____
- improve somewhat _____
- stay the same _____
- decline somewhat _____
- decline greatly _____

Please discuss the basis for your answer._____

_____

_____

_____

5. Discuss how the continued viability of a U.S. located commercial production base for bearings can contribute to the maintenance of a defense precision bearings production base.

_____

_____

_____

_____

6. Profitability: Enter the profitability of your U.S. precision bearing operations for the years indicated.

	1981	1982	1983	1984	1985
Net Sales (1)	____	____	____	____	____
Cost of Goods Sold (2)	____	____	____	____	____
Gross Profit or (Loss) (3)	____	____	____	____	____
Net income before taxes (4)	____	____	____	____	____

(1) Trade, including inter- and intracompany transfers
(2) Includes raw materials direct labor and other factory costs such as depreciation and inventory carrying costs.
(3) Difference between Net Sales and Cost of Goods Sold
(4) Gross Profit or (Loss) less general, selling and administrative expenses, interest expenses and other expenses, plus other income

NOTE

Under separate cover letter, the same questionnaire on page 102 was sent to additional bearing companies and ball and roller producers.

U.S. DEPARTMENT OF DEFENSE
JOINT LOGISTICS COMMANDERS
HEADQUARTERS AIR FORCE LOGISTICS COMMAND

NATIONAL SECURITY ASSESSMENT OF THE PRECISION BEARINGS INDUSTRY BALL AND ROLLER BEARINGS 30 MM AND LARGER AND ABEC OR RBEC 5 AND OVER

GENERAL INSTRUCTIONS

1. It is not our desire to impose an unreasonable burden on any respondent. IF INFORMATION IS NOT READILY AVAILABLE FROM YOUR RECORDS IN EXACTLY THE FORM REQUESTED, FURNISH ESTIMATES AND DESIGNATE BY THE LETTER "E". Any necessary comments or explanations should be supplied in the space provided or on separate sheets attached to this questionnaire. Ensure that you reference the proper question if you use extra sheets. If any answer is "none", please indicate.

2. Report calendar year data, unless otherwise specified in a particular question. Please complete Parts II and III separately for each of your establishments that produce precision bearings in the United States. Please make photocopies of forms if additional copies are needed. For Parts I, IV and V, firms operating more than one establishment may combine the data for all establishments into a single report.

3. A file copy of the questionnaire is enclosed for your records. While it would be a convenience to the Government for a file copy to be made and retained for reference purposes, no assurances can be provided that file copies are exempt from compulsory examination pursuant to some future legal process.

4. Questions related to the questionnaire should be directed to Mr. Dave Stanley, Supervisor Materials Engineer (619) 437-6711, Department of the Navy, or Major Terry Gower, Senior Program Analyst (513) 257-2622, HQ, Air Force Logistics Command.

Return completed questionnaire by March 18, 1986 to:

Department of the Air Force
HQ, AFLC/XRPD
Gilmore Hall, Post 211Q
Attn: Major Terry Gower
Wright-Patterson AFB
Dayton, OH 45433-5001

U.S. DEPARTMENT OF DEFENSE
JOINT LOGISTICS COMMANDERS
HEADQUARTERS AIR FORCE LOGISTICS COMMAND

NATIONAL SECURITY ASSESSMENT OF
GAS TURBINE ENGINE/TRANSMISSION MANUFACTURERS
USAGE AND FOREIGN SOURCING OF PRECISION BEARINGS:
Ball and Roller Bearings 30 mm and larger
and ABEC or RBEC 5 and over

GENERAL INSTRUCTIONS

The questionnaire is targeted to the usage of precision bearings as sub-components in gas turbine engine/transmission manufacturing operations and is not concerned with the other activities of your firm. Complete the questionnaire separately for establishment that produces gas turbine engines/transmissions in the United St. (Please photocopy the questionnaire as necessary.) The questionnaire is organized in five Parts as follows:

Part I	Receipt and Usage of Bearings
Part II	Leadtimes
Part III	Sole and Single Sourcing
Part IV	Foreign Sourcing
Part V	Importance of a Domestic Bearing Industry

Note: BEARINGS USED IN, OR IN SUPPORT OF, FOREIGN MILITARY SALES, DEFENSE RELATED LICENSE AGREEMENTS, OR OFFSET AGREEMENTS ARE TO BE INCLUDED AS DEFENSE BEARINGS.

It is not our desire to impose an unreasonable burden on any respondent. IF INFORMATION IS NOT READILY AVAILABLE FROM YOUR RECORDS IN EXACTLY THE FORM REQUESTED, FURNISH ESTIMATES DESIGNATE BY THE LETTER "E". Comments or explanations should be supplied in the space provided or on separate sheets attached to this questionnaire. Ensure that you refer to the proper question if you use extra sheets. If any answer is "none", please indicate. Before completing the questionnaire, please read the definitions on the next page.

A file copy of the questionnaire is enclosed for your records. While it would be appreciated if compliance to the Government for a file copy to be made and retained for reference purposes, no assurances can be provided that file copies are exempt from compulsory examination pursuant to some future legal process.

Questions related to the questionnaire should be directed to Mr. Ed Graham, Chief, Industrial Preparedness Branch, (215) 697-2725, Defense Industrial Supply Center, Defense Logistics Agency, Mr. Mike Mead, Propulsion Engineering Manager (202) 692-2613, Department of the Navy, or Major Terry Gower, Senior Program Analyst (513) 257-2622, Headquarters, Air Force Logistics Command.

Information furnished in response to this questionnaire will be treated as proprietary and will not be published or otherwise divulged to reveal the operations of individual firms.

Return completed questionnaire by March 21, 1986 to:

Department of the Air Force
HQ, AFLC/XRPD
Gilmore Hall, Post 211Q
Attn: Major Terry Gower
Wright-Patterson AFB
Dayton, OH 45433-5001

PART I - B. IMPORTED NON-DEFENSE BEARING RECEIPTS

For the size and quality standards indicated below, enter the imported units and dollar value of non-defense bearings delivered for use in your engine/transmission manufacturing activities in 1981, 1983 and 1985.

(in thousands of units and thousands of dollars)

	1981		1983		1985	
	(units)	($000s)	(units)	($000s)	(units)	($000s)
Radial Ball Bearings (including self-aligning)						
Below 9-30 mm O.D. (ABEC 1 and over)	____	____	____	____	____	____
Over 30 mm O.D. (ABEC 1 and 3)	____	____	____	____	____	____
ABEC 5 and Over						
Over 30-52 mm O.D.	____	____	____	____	____	____
Over 52-100 mm O.D.	____	____	____	____	____	____
Over 100-170 mm O.D.	____	____	____	____	____	____
Over 170-240 mm O.D.	____	____	____	____	____	____
Over 240-580 mm O.D.	____	____	____	____	____	____
Over 580 mm O.D.	____	____	____	____	____	____
Roller Bearings						
0-2" O.D. (RBEC 1 and over)	____	____	____	____	____	____
Over 2" O.D. (RBEC 1 and 3)	____	____	____	____	____	____
RBEC 5 and Over						
Over 2-4" O.D.	____	____	____	____	____	____
Over 4-6" O.D.	____	____	____	____	____	____
Over 6-8" O.D.	____	____	____	____	____	____
Over 8-10" O.D.	____	____	____	____	____	____
Over 10" O.D.	____	____	____	____	____	____

PART I - D. IMPORTED DEFENSE BEARING RECEIPTS

For the size and quality standards indicated below, enter the imported units and dollar value of defense bearings delivered for use in your engine/transmission manufacturing activities in 1981, 1983 and 1985.

(in thousands of units and thousands of dollars)

	1981		1983		1985	
	(units)	($000s)	(units)	($000s)	(units)	($000s)
Radial Ball Bearings (including self-aligning)						
Below 9-30 mm O.D. (ABEC 1 and over)	____	____	____	____	____	____
Over 30 mm O.D. (ABEC 1 and 3)	____	____	____	____	____	____
ABEC 5 and Over						
Over 30-52 mm O.D.	____	____	____	____	____	____
Over 52-100 mm O.D.	____	____	____	____	____	____
Over 100-170 mm O.D.	____	____	____	____	____	____
Over 170-240 mm O.D.	____	____	____	____	____	____
Over 240-580 mm O.D.	____	____	____	____	____	____
Over 580 mm O.D.	____	____	____	____	____	____
Roller Bearings						
Over 2" O.D. (RBEC 1 and over)	____	____	____	____	____	____
Over 2" O.D. (RBEC 1 and 3)	____	____	____	____	____	____
RBEC 5 and Over						
Over 2-4" O.D.	____	____	____	____	____	____
Over 4-6" O.D.	____	____	____	____	____	____
Over 6-8" O.D.	____	____	____	____	____	____
Over 8-10" O.D.	____	____	____	____	____	____
Over 10" O.D.	____	____	____	____	____	____

LEADTIMES - DOMESTICALLY PRODUCED BEARINGS FOR DEFENSE: Enter below by size and quality group the average leadtimes (in weeks) you experienced in 1985 for domestically produced bearings used in defense systems. In the last three columns, enter the bearing part number within each group with the longest average leadtime, its leadtime, and the quantity of that bearing received in 1985.

Size and Quality Group	Average Leadtime in 1985 (weeks)	Bearing Within Size Group with Longest Average Leadtime in 1985 (part number)	Longest Average Leadtime in 1985 (weeks)	Quantity of Longest Leadtime Bearing Received in 1985 (units)	($000)
Radial Ball Bearings (including self-aligning)					
Below 9-30 mm O.D. (ABEC 1 and over)					
Over 30 mm O.D. (ABEC 1 and 3)					
ABEC 5 and Over					
Over 30-52 mm O.D.					
Over 52-100 mm O.D.					
Over 100-170 mm O.D.					
Over 170-240 mm O.D.					
Over 240-580 mm O.D.					
Over 580 mm O.D.					
Roller Bearings					
0-2" O.D. (RBEC 1 and over)					
Over 2" O.D. (RBEC 1 and 3)					
RBEC 5 and Over					
Over 2-4" O.D.					
Over 4-6" O.D.					
Over 6-8" O.D.					
Over 8-10" O.D.					
Over 10" O.D.					

PART III - SOLE AND SINGLE SOURING

1. Identify domestically produced sole source or single source precision bearings by size group used in your defense production operations and name the firm supplying the bearings. Give the reason(s) for sole or single sourcing (e.g., small volumes, technical complexity, only one source available, etc.). State how much time would be needed to qualify an alternative supplier.

Identify foreign produced sole source or single source precision bearings by size group used in your defense production operations and name the firm supplying the bearings. Identify the supplier and give the reason(s) for sole or single sourcing (e.g., small volumes, technical complexity, offset agreements, etc.). State how much time would be needed to qualify an alternative supplier.

6. FOREIGN SOURCES - Please provide the information requested in the table below for each foreign source from which you obtain bearings for defense or non-defense applications, or both. Under the column headings "Reasons Foreign Sources Used" and "Competitive Advantage(s) over U.S. Based Production" please use the letter codes given below. Use as many of the codes for the named foreign source as applicable. Any qualifying comments can be made on the next page.

Reasons Foreign Source Used

a. Competitive advantages over U.S. firms
b. We were approached by foreign firm with an attractive offer
c. Part of an offset/countertrade agreement
d. Domestic source not available
e. Tied to a joint venture
f. Other (specify)

Competitive Advantages Over U.S. Based Production

a. Lower prices
b. Superior quality
c. Better performance
d. Better reliability
e. Shorter leadtime
f. More responsive
g. Spare parts availiability
h. Superior design and engineering capabilities
i. Government supports
j. Other (specify)

Name of Foreign Source	Country of Origin	Year First Used	Name of Qualified Domestic Source	Reason(s) Foreign Sources Used (see codes)	Competitive Advantage(s) Over U.S. Based Production (see codes)	1985 Dollar Value Received Defense ($000)	Non-Defense ($000)

PART V - IMPORTANCE OF A DOMESTIC BEARING INDUSTRY

1. SECURITY OF SUPPLY - How important do you think a domestic capability to produce bearings is during a) peacetime b) a surge, and c) a mobilization? (see definitions of surge and mobilization)

2. TECHNOLOGY BASE - In your opinion, how important to the technological advancement and product development of bearings is a domestic bearing manufacturing capability?

3. SUBSTITUTION - In what ways, if any, can your requirements for bearings be reduced without sacrificing the performance of your defense engine systems (e.g., new designs, simpler products, fewer moving parts, etc.)?

4. What recommendations could you offer that would help the U.S. Bearing Industry be more competitive with foreign manufactured bearings, and also be more responsive to your requirements?

QUESTIONNARIE
FOR THE BEARING AND ENGINE MANUFACTURERS VISITS

1. What are your perceptions of the problems confronting the U.S. domestic bearing industry?

2. Do you feel that we have addressed the major problems that face the U.S. Bearing Industry in our questionnaire?

3. What additional concerns should we be addressing?

4. Can the U.S Bearing Industry compete with foreign bearing producers in the U.S. and/or foreign markets?

5. What steps should be taken by the U.S. government to strengthen the domestic bearing industry? e.g. Economic Recovery Tax Act of 1981. Accelerated Cost Recovery System; Investment Tax Credit; R&D Tax Credit; Effective Corporate Tax Rate; Small Business Innovation Development Act of '82; Federal Sales Corporation Act.

6. Is some type of protectionist legislation/regulation the answer, eg: domestic purchase requirements; increased tariffs on foreign imports; reduced import allowances; change in tax laws; etc?

7. What will be the economic impact of imposing trade restrictions/tariffs on the importation of foreign steel on the domestic bearing industry?

8. What is/has been the effect of foreign takeovers of U.S. Bearing Companies? What in your opinion will happen if the current trend continues without government intervention?

9. In your opinion what role should the U.S. Government assume in efforts to preserve a domestic bearing industry?

10. Can/will the U.S Bearing Industry continue to produce the required precision bearings for military applications without a strong commercial base for high production run commercial bearings?

11. Should a national plan be established and implemented that would ensure domestic sources for all raw materials and component parts used in the manufacture and protection of precision ball/roller bearings?

12. Should the DOD continue to help industry fund projects under such programs as "Tech Mod", Title III", or "IMIP"? Will programs of this type significantly help the bearing industry survive, and/or compete with foreign bearing producers?

13. Do multi-national bearing companies that operate manufacturing plants in the U.S. and in foreign countries present "unfair" cost/manufacturing advantages over bearing companies that operate only in the U.S.? If so, what?

BEARING STEEL SURVEY

1. What is your current annual manfacturing capacity of steel used in ball/roller bearings?

Classify by steel type:
- AISI 52100 Bearing steel
- AISI 440C Corrosion resident steel
- M50 Tool steel
- M50 NIL Tool steel mod with nickel
- Case Hardened steels
- Other

NOTE: Differentiate VIMVAR double vacuum melted steel from AIRMELT steel

2. What is your current production utilization (percentage) of your capacity by type?

3. What is the estimated percentage of current steel producation/annual business that is in support of military application, by type?

4. What is your surage capacity to meet military requirements in a national emergency? (3,6,12 months)

5. Do you plan to increase your capacity to produce bearing quality steel? If so, how much? and what type?

6. What is the dollar value and quanity of the bearing quality steel produced by your company?

7. What is your current production processing time for bearing quality steel? What are the current leadtimes for producing bearing quality steel after receipt of order? Are they increasing/descreasing? If they are increasing what are the reasons/causes?

8. How would reduced production of U.S Bearings affect your company in continued productions of bearing quality steel? Short term/long term?

9. If enacted, how would requiring domestic procurement of bearings for the military affect your company?

10. What steps/actions do you feel need to be taken to ensure the continuance of a strong and viable domestic bearing manufacturing base that will/can meet the needs of the military and commercial bearing markets for precision ball and roller bearings?

11. Do you import foreign produced steel for resale to supplement domestic steel productions?. If yes, explain.

10. If enacted, how would requiring the domestic procurement of bearings for the military affect your company?

11. If enacted, how would requiring domestic procurement of steel affect your company?

12. If enacted, how would increased tariffs and/or reduced import allowances on foreign produced steel affect your company?

13. What steps/actions do you feel need to taken to ensure the continuance of a strong and viable domestic bearing manufacturing base that will/can meet the needs of the military and commercial bearing markets for precision ball/roller bearings?

7. How can the U.S. Government help to make the U.S. Bearing Industry more competitive?

   a. If the Governmemt places a requirement on procurements for military applications to require domestic purchases, how would it affect your company?

   b. Other?

7. What actions can the U.S. Machine Tool Manufacturers take to help the U.S. Precision Bearing Industry better meet your requirements?

8. What actions could the U.S. Government take that would help the manufacturers meet military requirements that would also aide the U.S. Bearing Industry?

9. What recommendations could you offer that would help the U.S. Bearing Industry be more competitive with foreign manufactured bearings, and also be more responsive to your requirements?

10. Do your have a contingency plan in the case of foreign bearing source cutoff?

BALL MANUFACTURING SURVEY

1. What is your current total annual manufacturing capacity of balls?

2. What is your current annual manufacturing capacity of balls devoted to precision bearings over 30mm outer diameter? Precision: Grade 25 and Grade 10. Size: 7/32 nds and larger.

3. What is your current production utilization (percentage) of your capacity, by size?

4. What is the percentage of current ball production/annual business that is in support of military applications, by size?

5. What is your surge capacity to meet military requirements in a national emergency? (3,6,12 months).

   a. Can your raw material suppliers surge to meet your requirements in a surge situation?

   b. Do you have any foreign suppliers/sole source suppliers that limit your ability to surge?

6. Do you plan to increase/decrease your capacity for producing balls?

   a. What are those plans, and how much of an increase in production capacity will be realized?

7. What is the dollar value and quanity of balls produced by your company?

8. What is the manufacturing process time for producing balls? What are the current leadtimes for producing balls after receipt of order? Are they increasing/decreasing? If they are increasing what are the reasons/causes?

9. Identify current production problems that may be contributing to the long leadtimes. Is there any current action/planned action to correct these problem areas?

10. Are you currently involved in a government sponsored modernization program? Are you planning to participate in one?

11. Who is your source of supply (domestic or imported), for the following steel types?

   AISI 52100 AISI 440C M50

   a. If steel is imported, why? (Price, availability, quality) What is the percentage of imported steel vs domestic steel?

   b. How much of an inventory of M50/440c/52100 steel do you maintain?

   c. How long could you maintain ball production if supplies were cut off?

   d. What can be done to improve availability of the proper type and quality steel used by your company?

   e. What would happen if foreign sources of steel were cut off?

12. If enacted, how would requiring domestic procurement of steel bearings for the military affect your company?

APPENDIX F

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